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HENRY (L. K.). **Ecological notes on fungi.**—*Proc. Pa Acad. Sci.*, xix, pp. 140–142, 1945.

Notes are given on the ecology of fungi found growing on burned-over soil supporting a mixed oak type of vegetation on a section of the State Game Lands, Pennsylvania, and on mixed oak slash piles from the previous year's thinning. The author concludes that the Myxomycetes are concerned in the initiation of slash decay and subsequently disappear, and that the annual leathery Polyporaceae are the principal agents of disorganization, followed by the perennial and woody species, *Stereum* spp., and Ascomycetes.

RENNERFELT (E.). **Inverkan av Tallkärnvedens fenolsubstanser på några blåytesvampars tillväxt jämte ett försök till kvantitativ mättning av blånadens intensitet.** [The influence of the phenol substances of Pine heartwood on the growth of some blueing fungi together with an experiment on the quantitative determination of the intensity of blueing.]—*Medd. Skogsförsöksanst., Stockh.*, xxxiv, pp. 391–416, 1 diag., 3 graphs, 1946. [English summary.]

The phenolic substances in Scots pine (*Pinus sylvestris*) heartwood, pinosylvin and pinosylvin monomethylether [*R.A.M.*, xxiii, p. 506], were shown to exert a considerable degree of inhibition on various agents of blueing [ibid., xxiv, p. 348] in malt agar cultures at 22° C. For instance, taking 100 as the standard figure for growth in 1 per cent. ethyl alcohol, the addition to the test tubes of 0·02 per cent. pinosylvin entirely inhibited the development of *Phialophora fastigiata*, *Phoma lignicola*, and *Pullularia pullulans*, while the relative figures for *Cladosporium herbarum* and *Stemphylium graminis* were 3 each. Pinosylvin monomethylether acted similarly but less powerfully, none of the fungi being entirely suppressed even at the maximum dosage of 0·02 per cent., at which the growth of the three most sensitive, *C. herbarum*, *Phoma lignicola*, and *S. graminis* was represented by 8, 10, and 5, respectively. *Phialophora fastigiata* was highly resistant to pinosylvin monomethylether, and *Ophiostoma* sp. to both substances.

Further experiments were made on sterilized pine sapwood blocks, impregnated with the phenolic substances, which were inoculated with spore suspensions of the blueing organisms (1,000,000 spores per ml.) by a 10-second dip and placed in Petri dishes kept moist with filter paper, another series of untreated blocks being similarly inoculated for control purposes. The intensity of infection was estimated by comparison with standard briquettes made of mixtures in different proportions of wood flour and a combination of 1 part of animal charcoal to 2 parts fresh spruce needles, their colour ranging from the natural hue of the wood to almost black. The colour of briquettes was estimated electrically by the General Electric Reflection Meter or Brightness Tester (*Paper Tr. J.*, c, 26, 1935), the 'pigment' unit being an equivalent to the amount of pigment in a briquette made from a mixture of 10 gm. wood flour and 0·01 gm. charcoal and needles.

All the blueing fungi made good growth on natural sapwood, but their capacity for pigmentation varied considerably, being greatest in *S. graminis* (75) and least

in *O.* sp. (6), while *C. herbarum* and *P. fastigiata* were intermediate (33). On the treated blocks there was a substantial reduction of pigment production, e.g., in the case of *S. graminis*, to between 2·9 and 7·9 and 1·6 to 13 for those impregnated with pinosylvin and pinosylvin monomethylether, respectively.

In further tests the discoloration of natural sapwood was found to increase from the first week to the third, but in the blocks impregnated with 1·4 per cent. pinosylvin monomethylether the fungi made little headway until the third or fourth week; by this time *P. fastigiata*, in particular, had caused considerable blueing (7·6 pigment units at the end of the month).

Compared with the reflection-meter method, the visual estimation of discoloration by the three-grade scale of Lagerberg *et al.*: [*R.A.M.*, ix, p. 76] was found to be inaccurate and unreliable.

Scheffer (T. C.) & van Kleeck (A.). **The decay resistance of wood impregnated with fire retarding ammonium salts.**—*Proc. Amer. Wood Pres. Ass.*, xli, pp. 204–210, 1945.

Laboratory tests indicated that commercial absorptions (2, 4, and 6 lb. per cu. ft.) of mono- and diammonium phosphate and of ammonium sulphate, used for fire-proofing timber, conferred a high initial resistance to decay in pine sapwood, and even after considerable leaching had taken place decay resistance usually remained high and never fell below that of untreated wood. It is thought that treatment with these salts of timber to be used above ground may provide a substantial degree of protection against decay, but field tests are required to confirm these laboratory results. There was no evidence that the preservative values of borax, boric acid, and zinc chloride were impaired by combining with them the above-mentioned salts.

Starker (T. J.). **Preservative treatment of fence posts: 1944 progress report on the Post Farm.**—*Bull. Ser. Ore. Engng Exp. Sta.* 9 F, 7 pp., 1 graph, 1945.

At the seventh annual examination of the Post Farm at the Oregon State College on 17th October, 1944 [*R.A.M.*, xxiv, p. 171], 29 posts were removed on account of failure, of which eight were in the untreated Douglas fir [*Pseudotsuga taxifolia*] series. The first failure in 16 years occurred among the 25 lodgepole pine [*Pinus contorta*] posts treated with a mixture of mercuric chloride, arsenic oxide, and sodium chloride. All the 25 western hemlock [*Tsuga heterophylla*] and 25 Douglas fir posts set in 1936 after treatment with Wolman salts [triolith] were still in position at the date of inspection, and so were 25 each of the Douglas firs set in 1928 after the introduction of mercuric chloride through one, two (in combination with arsenic oxide), or three holes, or treated with ACM treater dust.

Severin (H. H. P.) & Frazier (N. W.). **California Aster yellows on vegetable and seed crops.**—*Hilgardia*, xvi, 12, pp. 573–596, 8 pl., 7 figs., 1945.

The host range of the California aster yellows virus [a strain of aster yellows virus] among economic plants naturally infected includes 11 vegetables and 12 seed crops belonging to 14 species in 12 genera in 6 families, some of which have been previously reported [*R.A.M.*, vi, p. 297; viii, p. 694; x, p. 734; xx, p. 130; xxii, p. 206, and next abstract]. The following hosts may be mentioned: spinach (overlapping host ranges of California and New York aster ranges), chicory, endive, black salsify (*Scorzonera hispanica*), lettuce, Romaine lettuce (*Lactuca sativa* var. *longifolia*), cabbage, cauliflower, sprouting broccoli, Chinese radish, onion, potato, Belgian carrots, parsley, turnip-rooted parsley (*Petroselinum hortense* var. *radicosum*), celery, celeriac, and parsnips. The virus overwinters in biennials, perennials, and overwintering leafhoppers. Symptoms induced by the virus on each species or variety naturally infected are described.

POUND (G. S.). **Effect of air temperature on the concentration of certain viruses in Cabbage.**—*J. agric. Res.*, lxxi, 11, pp. 471–485, 1 fig., 1945.

The results presented in this study interpret observations on the epidemiology of the cabbage mosaic disease as it occurs in the mid-western area of the United States. In the latitude of Wisconsin the symptoms of virus A [a strain of turnip mosaic virus: *R.A.M.*, xxiv, p. 439; xxv, p. 53] appear in early summer and only decline with the gradual lowering of the temperature in the late summer and autumn, when virus B [a strain of cauliflower mosaic virus] becomes predominant. Isolations of virus A from field plants late in the season yielded insignificant concentrations and often none at all, but virus B responded abundantly. A reduced rate of production of virus A and an increase in that of B is thought to account for these reactions. It is further remarked that in the southern belt of States, where cabbage is grown in winter and early spring, virus B is much more in evidence than A. In regard to the black-ring disease of cabbage [a strain of turnip mosaic virus], which Tompkins *et al.* [ibid., xvii, p. 151] state is essentially a winter disease and not often encountered in summer, temperature studies failed to provide any explanation for this; in one experiment the present author found that the effect of temperature on black-ring virus concentration was similar to that on virus A, but earlier work had shown the black-ring virus to cause more virulent necrosis at low temperatures than virus A.

Quantitative studies showed that length of day had no measurable effect upon virus concentration, but the symptoms of A alone and A and B together were less severe, and those of B alone more so under short- than under long-day exposures. Special interest is attached to the fact that viruses A and B exhibit a parallel increase of symptoms with increase in virus concentration. Virus A and black-ring virus occurred in notably higher concentration in plants growing at 28° C. than in others grown at 16°, both when infecting cabbages alone or together with either cabbage virus B or cauliflower mosaic virus. The concentration of cabbage virus A in cabbage grown in a 15-hour day at either 28° or 16° was not significantly different from that in plants growing in an 8-hour day, whether the virus occurred alone or together with virus B in the host. Virus concentration in plants inoculated with A or A and B together, incubated at 22° and later removed to the greenhouse at temperatures of 16° and 28°, respectively, fell in the case of A in plants at 16° below that in those grown at 28°. Virus B shows the reverse tendency. The systemic accumulation of virus A in plants inoculated and held at 5° for 60 days was almost negligible, but when these plants were transferred to a temperature of 28°, the virus concentration after 30 days differed little from that in plants which had grown 90 days at the same temperature. Virus A concentration in plants infected with A or both viruses differed little. It is thought that the increased severity of symptoms in A and B viruses together over that of either virus alone arises from the cumulative effect of each virus on the host metabolism. As cooler temperatures prevail in autumn the concentration of virus A falls progressively.

Finally, the author points out that the effects of the temperature factor on virus concentration are sufficiently strong to justify due consideration of the temperature at which the host is grown when the physical properties of a given virus are being examined, because the original concentration of the virus extract may to a large extent determine the point at which inactivation is noted as a result of dilution, ageing, or exposure to given temperatures.

FELTON (M. W.) & WALKER (J. C.). **Environmental factors affecting downy mildew of Cabbage.**—*J. agric. Res.*, lxxii, 2, pp. 69–81, 4 figs., 1946.

Investigations at the Wisconsin Agricultural Experiment Station on the effect of environmental conditions upon the development of downy mildew (*Peronospora parasitica*) [*R.A.M.*, xxiv, p. 259; xxv, p. 196] on cabbage seedlings showed that the

optimum temperature for sporulation of the fungus is from 8° to 10° C., for conidial germination ranges from 8° to 12°, and penetration of the host occurs most rapidly at 16°. Thus, relatively low temperatures are required for the rapid reproduction of *P. parasitica* as a major pathogen of cabbage.

The optimum temperature range for the development of the haustoria was between 20° and 24° and the most rapid development of disease occurred at 24°. In the presence of high humidity, those lesions first noticed also sporulated first. At the same time, it was evident that the rapidity of infection was conditioned by the temperature most conducive to the spread of mycelium within the host. Temperatures of 24° and 28°, respectively, were the upper limits for sporulation and re-infection, and faster growth in the host at these temperatures led to more rapid maturation and falling of the lower leaves. Host and fungal growth was slower at 16°, but sporulation was most prolific and re-infection markedly more virulent. The lower optima for sporulation, germination, and penetration of the host are, therefore, more decisive for disease development than the higher optima for the growth of the fungus. The virulence of the disease at 10° to 15° may best be explained by the effect of temperatures on the production of inoculum, spore germination, and infection.

Studies of plants cultured in a range of controlled nutrients did not serve to elucidate the discrepant data recorded in the literature on the effect of fertilizers on *P. parasitica*, and control is not likely to be made more effective by endeavours to amend existing practice in fertilizing seed-beds.

Eradication of cruciferous weeds is considered valueless, having regard to the fact that collections of the fungus from widely separated localities in the United States all appeared to be representative of a single physiologic race, parasitic only on members of *Brassica oleracea*, which are not found growing in a wild state in that country.

RANGEL (J. F.). **Two Alternaria diseases of cruciferous plants.**—*Phytopathology*, xxxv, 12, pp. 1002–1007, 1 fig., 2 graphs, 1945.

Alternaria brassicae (Berk.) Sacc. [*A. oleracea* Milbrath], the agent of leaf and pod spot and general head-browning of cauliflower, broccoli, and other crucifer plants, and of damping-off, wire stem, and spotting of seedlings in the United States, is readily distinguishable by its morphological and cultural characters from *A. herculea* [*A. brassicae* (Berk.) Sacc.], another parasite of the same plant family causing a grey foliar spot [*R.A.M.*, xv, pp. 188, 467]. Both species are virulent pathogens, capable of attacking susceptible plants at any age and independently of injury, but a minimum wetting period of 18 hours is a pre-requisite condition for infection. Both fungi may be harboured by the seed in the form of spores or latent mycelium. The conidia of *A. oleracea* may retain their viability and pathogenicity for over six months. Seedlings grown in infested seed-beds may carry the inoculum to the field, where the organism is disseminated, mainly through the agency of water, from the dead lesions and decaying plant refuse. Cabbage seed treatment with semesan and arasan reduced the incidence of damping-off and wire-stem symptoms.

The cotyledons of seedlings from infected seeds bore sharply defined, circular, dark brown to black, sunken spots and damping-off may occur when very young seedlings are affected. When infection occurs after the seedling tissues have hardened, the seedlings survive but the stems are distorted and growth impaired, causing symptoms resembling wire stem due to *Rhizoctonia* [*Corticium*] *solani*. Pre-emergence damping-off may also occur.

HUIZINGA (T. S.). **'Bruin in de knol' bij Koolrapen.** ['Brown heart' of swedes.]—*Tijdschr. PlZiekt.*, xlvi, 4, pp. 141–145, 1940. [Received February, 1946.]

A tabulated account is given of experiments from 1937 to 1939 in the control of boron deficiency in swedes in the Aalst district of Holland [*R.A.M.*, xviii,

p. 153], where the crop is grown largely for human consumption. In the first year even the maximum dosage of 50 kg. borax (applied in the form of bibor, a product of the N.V. Landbouwbureau Wiersum, Groningen, containing 20 per cent. borax), failed to eliminate the trouble completely, whereas in the second 20 kg. sufficed to cure the condition.

WATSON (MARION A.). **The transmission of Beet mosaic and Beet yellows viruses by aphides : a comparative study of non-persistent and a persistent virus having host plants and vectors in common.**—*Proc. roy. Soc.*, Ser. B, cxxxiii, 2, pp. 200–219, 1 fig., 1946.

The author's researches show that the maximum capacity of the vectors (*Myzus persicae*, *Aphis fabae*, and *M. circumflexus*) for infecting beets with mosaic virus is when they have fed for only a few minutes on the infected plants after a period of fasting. After infection feeding, power to infect is rapidly lost by vectors feeding on healthy plants. However, as long as infective power remains a single vector can infect several plants. Infectivity is lost much more slowly when vectors fast after infection feeding.

In these functional characteristics, and also in its physical properties, this virus resembles virus Hy 3 [henbane mosaic virus], potato virus Y, cucumber virus 1 [cucumber mosaic virus], and other aphid-transmitted viruses, which have been called the non-persistent group.

Beet mosaic differs in some secondary characters from the other non-persistent viruses more than they differ from each other in being retained longer by the fasting vectors, and infectivity of the vectors may increase considerably with increasing infection feeding time, in the absence of preliminary fasting, though it rarely reaches the optimal level.

In beet yellows [*R.A.M.*, xxiii, p. 420; xxiv, p. 260] virus infectivity of the vectors is not affected by preliminary fasting, but always increases with increasing feeding time on both infected and healthy plants. Infectivity increases with increasing feeding time on the healthy plants whatever the infection feeding time, and consequently a delay always occurs before optimum infectivity is reached by the aphids after cessation of infection feeding. Loss of infectivity is more rapid in fasting than in feeding vectors.

The properties show that beet yellows belongs to the persistent group of viruses, although its persistence in fasting vectors is approximately the same as that of the non-persistent beet mosaic virus. The two types seem to be distinguished, not by the time for which they are retained by vectors, but by the effect of preliminary fasting.

As beet yellows and beet mosaic viruses have the same vector and host plant, the differences in their behaviour constitute properties peculiar to the viruses themselves, and are not induced by the conditions in which they are transmitted.

BENNETT (C. W.), CARSNER (E.), COONS (G. H.), & BRANDES (E. W.). **The Argentine curly top of Sugar Beet.**—*J. agric. Res.*, lxxii, 1, pp. 19–48, 8 figs., 1946.

These studies of the Argentine curly top disease of sugar beet, with special reference to its relationship to North American curly top and its potential capacity for injury if introduced into the sugar beet areas of the United States and other parts of the world, collate the results of investigations at Arlington, Virginia, on diseased plants from Argentina in 1927 and 1937 to 1939, and of work at the Tucumán Agricultural Experiment Station, Argentina, from September, 1940, to March, 1941.

North American curly top is distinguished from the Argentine variety by the following characteristics; the North American curly top vector (*Eutettix tenellus*) does not transmit the Argentine virus, which does not appear to infect tomato or

tobacco plants, although Giddings [*R.A.M.*, xvii, p. 786] has shown that some strains of the North American virus also do not do this; the Argentine virus causes more severe curling and distortion on seedlings of varieties resistant to North American curly top, but resistant and susceptible varieties throw off the Argentine infection in a marked degree. There has been no record of plants infected by the North American virus exhibiting this capacity for recovery, particularly in the case of susceptible varieties.

Striking similarities between the two diseases are shown in the almost complete identity of symptoms on all host plants on which they have been reported: all varieties of sugar beet bred for resistance to the North American virus have proved resistant to the Argentine type; the host range of both is the same, apart from some members of the Solanaceae; and at the present time their properties appear to be the same, or very similar.

Black's discovery [ibid., xxi, p. 36] of two strains of the potato dwarf virus, each transmitted by a different leafhopper, is thought to weaken the suggestions of those who are inclined to consider these viruses of the North and South American continents, respectively, as distinct and separate on the ground of the non-transmission of the South American pathogen by the North American vector. Superimposition of the North American on the Argentine virus is also considered to point to their being unrelated by virtue of the concept that complete infection of a plant by one virus confers immunity from attack by a cognate strain, but not by an unrelated virus. At the same time, Carsner's reinoculation of sugar beet plants attacked by an attenuated strain of the curly top virus had the result that infection became more complete [ibid., v, p. 339]; and Giddings [ibid., xvii, p. 786] showed that beet plants previously infected for at least a month by one strain of the virus were susceptible to attack by another in 15 combinations of 7 strains tested. The authors, therefore, are disposed to reject the evidence offered for the North and South American viruses being distinct and separate viruses.

On the various grounds cited above, the authors regard the North American curly top as caused by a single virus-complex—which they name *Ruga verrucosans* [ibid., xxiii, p. 85]; they consider the Argentine virus to be a variety, and name it *R. verrucosans* var. *distans*.

In the course of the experiments at Tucumán the behaviour of the Argentine vector, *Agalliana ensigera*, was studied and it was found in 1940–1 abundantly on mangelwurzels and sugar beets and less so on *Amaranthus* spp., *Portulaca* sp., *Datura stramonium*, *Zinnia elegans*, and *Chenopodium album*. Reproduction was effected readily on sugar beet and mangelwurzel, and *D. stramonium*, *D. meteloides*, *Z. elegans*, and to a lesser extent, *C. album* proved acceptable hosts for breeding. *Agalliana ensigera* failed to breed on tomato, Turkish tobacco, and *Nicotiana glutinosa*.

A. ensigera finds its nutrition in the phloem of sugar beet, leaving a partial sheath of salival secretion along the line of penetration. It recovers virus from phloem exudate liquids of infected beets, but differs from *E. tenellus* in not depositing salivary secretions in the liquids on which it feeds. The minimum incubation period of the virus in the insect, as observed, was 24 to 72 hours. A 36-day feeding period showed virus still present in viruliferous insects on a host plant immune from curly top.

Relatively high concentrations of the Argentine curly top virus appear to occur in the phloem of diseased sugar beets and mangelwurzels, the point of thermal inactivation lying between 75° and 80° C. Brief exposure to 50 per cent. alcohol did not inactivate the virus. Four of 20 actively growing sugar beet plants were successfully infected by needle. The virus was found to pass from the point of puncture by leafhopper inoculation at the distal end of a leaf downward to a distance of over 15 cm. in two hours. These properties are coincident with those observed in the behaviour of North American curly top virus.

KEN KNIGHT (G.). **Pea diseases in Idaho.**—*Bull. Ida. agric. Exp. Sta.* 253, 13 pp., 7 figs., 1944. [Received February, 1946.]

The most destructive diseases of the Idaho pea crop are stated to be *Aphanomyces* root rot (*A. euteiches*), seedling damping-off, and stunting and stem-girdling of older plants (*Sclerotinia* spp.), and *Fusarium* wilt (*F. oxysporum* var. *pisi* f. 1). *A. euteiches* is likely to cause heavy damage only in years with a very wet spring; tri- or quadrennial crop rotation should be practised, avoiding the susceptible lucerne, sweet clover [*Melilotus*], and vetch. Against *S.* spp., deep ploughing-under of plant debris to prevent re-infection by the sclerotia, and crop rotation, e.g., with small grains, grasses, maize, potatoes, beets, or forage legumes, are recommended. There are many good wilt-resistant varieties and selections available.

HARTER (L. L.), ZAUMEYER (W. J.), & WADE (B. L.). **Pea diseases and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1735, ii+28 pp., 15 figs., 2 maps, 1945.

In this bulletin, a revised edition of that issued in 1934 [*R.A.M.*, xiv, p. 279], notes are given in semi-popular terms on the symptoms, causes, and control of the chief diseases of peas in the United States.

HUYSKES (J. A.). **Over de beteekenis van borium voor de Boonencultuur.** [On the significance of boron in Bean cultivation.]—*Tijdschr. PlZiekt.*, xlvi, 4, pp. 133–140, 1 pl., 1940. [Received February, 1946.]

From a study of the relevant literature and field observations in Holland the writer concludes that beans (*Phaseolus vulgaris*) are very unlikely to suffer from boron deficiency under ordinary cultural conditions. They are, however, very susceptible to an excess of the element [*R.A.M.*, xxi, p. 26], developing typical symptoms of foliar stunting, chlorosis, marginal necrotic spotting, upward curving of the lamina, and so forth, in 1939 in a plot to which borax was applied at a dosage of 20 kg. per ha.—the usual preventive treatment for heart rot of beet. Since beets are frequently succeeded by early potatoes and beans in the crop sequence, injury to the last-named from the cumulative effects of boron in the soil is by no means improbable.

YU (T. F.). **The red-spot disease of Broad Beans (Vicia faba L.) caused by Botrytis fabae Sardiña in China.**—*Phytopathology*, xxxv, 12, pp. 945–954, 1945.

Red spot disease of broad beans, originally observed in Nanking by R. H. Porter in 1925, has been shown to be caused by *Botrytis fabae* Sardiña [*R.A.M.*, ix, p. 424; xvi, p. 724]. It is widely distributed in China, especially along the Yangtze river and near the coast, where the necessary high atmospheric moisture is provided for the two months prior to the bean harvest. Under environmental conditions suitable for the fungus, infected leaves may collapse or extensive defoliation preclude pod formation. The symptoms of the disease and the morphology and physiology of the pathogen are described. Of a large number of Leguminosae exposed to artificial infection by *B. fabae*, apart from broad beans, only vetch and garden and field peas reacted positively and showed slight infection, so that the host range of the fungus would appear to be very narrow.

The results of overwintering experiments suggest that perpetuation may be effected by the sclerotia, which survived the dormant period and germinated in the spring, although they have never been observed on diseased plants in the field. Conidia are formed in profusion on the foliage of early-infected plants and furnish abundant inoculum for the second outbreak, which commonly occurs in May, but they probably do not assist in the maintenance of the fungus through the winter.

Ken Knight (G.) & Blodgett (E. C.). **A survey of the diseases of the Carrot seed crop in Idaho with control recommendations.**—*Bull. Ida. agric. Exp. Sta.* 262, 23 pp., 18 figs., 1945.

The major diseases of carrots in Idaho were shown by surveys in 1943 and 1944 to be bacterial blight (*Xanthomonas carotae*) [*R.A.M.*, xxiii, p. 423], aster yellows [ibid., xxiii, p. 420], and storage rots (*Alternaria radicina*, *Sclerotinia sclerotiorum*, and *Botrytis cinerea*). Trials at the Idaho Agricultural Experiment Station indicate that carrot seed will tolerate ten minutes' treatment in hot water up to 136° F. but is seriously damaged at 142°. Aster yellows has been largely responsible for the decline of carrot and lettuce seed production on the Wilder Bench, the losses in the carrot crop in 1943 ranging up to 40 per cent. and averaging 10 to 15. In 1944 the damage was unimportant, but evidence was forthcoming of some current-season spread from the seed crop. 'Green dwarf', probably a virus of the aster yellows type, is characterized by a very stiff growth habit, thick, very dark green leaves, and late maturity.

Terrier (C.). **Méthode de préparation du blanc de Champignon de couche (Psalliota campestris).** [Mode of preparation of spawn of the hot-bed Mushroom (*Psalliota campestris*).]—*Annu. agric. Suisse*, lix, 10, pp. 949–952, 1945. [German summary.]

A method for the preparation of mushroom (*Psalliota campestris*) spawn devised at the Federal Experiment Station for Viticulture and Fruit Growing at Lausanne, consists essentially in the following processes [cf. *R.A.M.*, xxiii, p. 425]. The selected mushrooms are placed under a bell jar to open and sporulate, and the spores, falling on to a sterile glass slab, are transferred by means of a flamed scalpel to a test tube filled with sterile water. After dilution of the suspension to a suitable strength, the spores are sown in Petri dishes on Lambert's nutrient medium (*Mycologia*, xxi, pp. 332–335, 1922) [cf. *R.A.M.*, xx, p. 621] at 27° C. for germination. After 7 to 10 days the first germinated spores are subcultured in test tubes on 4 per cent. malt agar, and a fortnight later the mycelium will be sufficiently developed for removal to l. flasks containing 300 gm. sterile wheat. The inoculated flasks are laid in the incubator until the whole mass of wheat is permeated by the mycelium, which can then be used as spawn without any further treatment.

Morwood (R. B.). **Peanut diseases.**—*Qd agric. J.*, lxi, 5, pp. 266–271, 6 figs., 1945.

After pointing out that during the period 1934 to 1944, the groundnut crop in Queensland, as a result of routine seed treatment and the adoption of a seed distribution scheme based on crop inspections and individual plant selections, showed remarkable improvement as regards the incidence of disease, the author gives brief notes on the symptoms and control of the conditions known as seedling blight and crown rot (*Aspergillus* sp.), wilt (*Fusarium* or *Verticillium* sp.), leaf spots (*Cercospora personata* and *C. arachidicola*), and the virus diseases rosette (not so far recorded from Queensland), chlorosis, bunchy top, and leaf curl [*R.A.M.*, xix, p. 459].

Seedling blight and crown rot appears as a rot starting in the seed leaves and spreading to the stem. The rotting may produce a dry, shredded effect or may be wet and slimy. Breakdown of the stem may occur at any stage from germination to maturity. When the rot occurs early in germinating seed, the plants may not appear above ground. It may also develop in the germination trays. When well-grown plants are attacked by crown rot, they appear at first to be affected by a general wilt; the tissues just below ground-level are found to be dark, shrunken, and shredded; they often show the presence of black masses of spores of an *Aspergillus*. This is regarded as a weak parasite which enters the plant through

mechanical injury. Control consists in careful shelling and treating the kernels with ceresan or agrosan (1 oz. per 20 lb. seed for the Virginia Bunch variety and one-third this rate for Red Spanish).

MILLER (J. J.). **Studies of the Fusarium of Muskmelon wilt. II. Infection studies concerning the host range of the organism and the effect of environment on disease incidence.**—*Canad. J. Res.*, Sect. C, xxiii, 5, pp. 166–187, 2 pl., 7 graphs, 1945.

Continuing his studies on the causal fungus of muskmelon wilt (closely similar to *Fusarium bulbigenum* var. *niveum* f. 2) [*R.A.M.*, xxiv, p. 351], the author reports on the effect of environment on disease incidence, working with (*a*) a mixture of ½ loam, ¼ sand, ¼ leaf mould, (*b*) Vineland clay loam, (*c*) light sandy soil from knolls in (*b*) area, and (*d*) Vineland fine sandy loam.

In comparative experiments, six flats of each of these soils were used, three of which were sterilized, all being inoculated with oat-hull inoculum except the two controls that received only sterilized medium. Disease incidence (assessed on the number of seedlings that wilted) was seen to be consistently more severe in sterilized and less in the unsterilized soils. It is assumed that the reason for this may be that organisms in the unsterilized soils tended to hinder the activities of the pathogen. It was shown that the physical nature of the soil was not responsible for the variation in disease incidence, which differed considerably in the two sandy soils on the one hand, and in the leaf mould mixture and Vineland fine sandy loam, on the other.

The effect of various degrees of soil infestation on incidence was tested in dilution series ranging from 0 to 4 per cent. concentration of inoculum on sterilized and unsterilized soils, and the depressing effect on disease incidence of the competitive factor shown to be greater where the pathogen was added at the higher dilutions. It may be, therefore, that the action of other organisms in unsterilized soils arrests the development of the inoculum.

It was observed that even a low level of soil infection is able to cause severe wilt, which suggests the possible epiphytotic effects of small quantities of inoculum in a field, while the overwintering of quite small amounts of inoculum might prove enough to support the pathogen after it had become established.

Of 124 seedlings grown in naturally infested soil only one wilted after a month, although the pathogen was known to be present in the soil, and this again would seem due to the high sensitivity of the parasite to competing soil organisms, which tends to exercise a protecting effect on the host. Considerable stunting was, however, associated with this protection and is also attributed to biological causes, though there was no evidence that the wilt *Fusarium* is a material factor contributing to it. Soil-temperature studies in Wisconsin tanks showed a decrease in disease incidence above 30° C., but no minimum temperature was discovered below which the host grew well and escaped infection. Low soil moisture favoured a high disease incidence (90 as against 78 per cent.), and the seedlings grew better in the moist soil. The parasite as found in nature invariably exercised a more toxic effect than its cultural variants on all host varieties tested, and this points to the importance of employing the virulent wild type when infecting soils in resistance experiments.

STUBBS (L. L.). **The control of Celery leaf-spot in commercial nurseries.**—*J. Dep. Agric. Vict.*, xliii, 12, pp. 512–516, 4 figs., 1945.

The only celery disease of economic importance in Victoria is leaf spot (*Septoria apii-graveolentis*) [*R.A.M.*, xxiv, pp. 158, 305]. This has been a limiting factor to production in the Melbourne market-garden districts, where most of the Victorian celery is grown. Infection has been specially prevalent in early and late plantings,

when moist, cool conditions favour spread. The most popular variety grown locally, Golden Self Blanching, is highly susceptible.

In tests carried out in 1941–2 on Golden Self Blanching seed showing 70 to 80 per cent. infection, complete control was secured by treatment with various chemicals and also by hot water (118° F. for 30 minutes, and then soaking in cold running water for five), all treatments being followed by hot-air oven-drying at 90° for 15 hours.

In 1942–3, the most successful treatments were applied to bulk samples of seed. All were equally effective when the seed was sown immediately, but when it was stored for several weeks the chemical treatments caused a marked decrease in germinability. For the rest of the season and during the two following all celery seedlings produced in the same nursery (1942–3, 590,000; 1943–4, 640,000; and 1944–5, 740,000) were raised from hot water-treated seed, and all save two or three boxes (in one season) were completely free from leaf spot. All the seed was treated in a thermostatically controlled water-bath with a sensitivity of $\pm 0{\cdot}1°$ C.

Growers should expect some reduction in germinability as a result of the hot-water treatment. Seed two years old or more should not be treated. It should not occupy more than half the volume of the muslin bag, which should be weighted externally to ensure complete immersion. A more efficient container can be made from brass wire gauze. If more than 1 lb. seed is to be treated, it should be divided and each half treated separately. The temperature of the bath must be exactly 118° F. The container should be agitated for several minutes after immersion, and the bath stirred from time to time during the treatment. After 30 minutes exactly, the seed should be spread out to dry rapidly in a thin layer on an absorbent surface. A suitable wind-tunnel to facilitate drying can easily be made with an electric fan and a heating element.

ROLAND (G.). **Sur une microméthode sérologique pour l'étude des viroses végétales.** [On a serological micromethod for the study of plant virus diseases.]—*Parasitica*, i, 3, pp. 106–112, 1 pl., 1945. [Flemish summary.]

In this account of a study of Stapp's method for the identification of viruses (*Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, lxvii, p. 9, 1943) [*R.A.M.*, xxiii, p. 496], the author states that Stapp uses as the antigen source tobacco plants inoculated with the virus of which it is desired to prepare the anti-serum. Three to five weeks after inoculation the juice is extracted, treated, centrifuged, and the virus obtained in a strong concentration in a physiological salt solution or Ringer's solution. This solution is then inoculated into rabbits and the serum obtained, which is then used by a rapid and easy drop-precipitation method. To secure the micro-sero-reaction, potato leaflets or pieces of tobacco leaf are pressed, and the juice allowed to run into a centrifuge tube. An equal volume of 0·5 per cent. sulphate of soda or physiological salt solution is added, the mixture centrifuged and decanted, and a drop placed on a slide with a drop of anti-serum. When the two drops have mixed the slide is maintained at 23° C., for 20 to 30 minutes. A positive reaction is shown by the appearance of a flocculent precipitate.

The results obtained showed that while the method may be used on different species of plants and at any season for the detection of potato virus X, this is not the case with viruses Y and A. The anti-virus Y serum gave negative results on potatoes in the field, though most of the time the plants showed characteristic symptoms. The anti-virus A serum sometimes gave distinctly positive reactions on potatoes infected with A but the reaction was frequently weak or lacking.

The paper concludes with a note on certain modifications of Stapp's method introduced by the author, as regards the production of anti-virus X serum; these concern the choice of plant to be used as a source of the virus, and the number of injections made in the rabbit.

CIFERRI (R.). **Relazione sul' attività del R. Laboratorio Crittogamico e del R. Osservatorio Fitopatologico durante l'anno 1942.**—[Report on the activity of the Royal Cryptogamic Laboratory and the Royal Phytopathological Observatory during the year 1942.]—*Atti Ist. bot. Univ. Pavia*, Ser. 5, i (1), pp. 7–83, 16 figs., 1943. [Received February, 1946.]

This report on plant disease work at Pavia in 1942 contains, *inter alia*, the following items of interest. A specimen of lucerne from Tripolitania showed the presence of the mycelium of *Rhizoctonia violacea* [*Helicobasidium purpureum*], together with the pycnidia of a fungus resembling the description of *Phoma roseola*, except that the spores were rather smaller, averaging 4 by 3 μ.

Observations on vine mildew (*Plasmopara viticola*) in several localities showed that primary infection is not always on the lowest branches, as at Canneto the oil spots of the first infection occurred at 1·5 m. from the ground. The formation of the oil spots and the development of the fungus are often so closely associated with microclimatic conditions that the progress of the disease seems to differ from one vineyard to another. Attacks on the fruit clusters were particularly severe in 1942; sometimes the relation between the outbreak and rainfall was clear, at others it was not, and infection seemed to be associated with particular races of the fungus able to attack the bunches even in moderately dry conditions. In June and July, mildew was often observed on the leaf veins without the preceding oil spots.

Oleander branches from Tripoli showed swellings due to *Bacterium tumefaciens* [*R.A.M.*, xix, p. 582]. Dates, also from Tripoli, were affected by mould due to *Aspergillus phoenicis* [ibid., x, p. 184; xxii, p. 468], a fungus previously observed by the author on cacao fruits in the Dominican Republic.

Dark spots with blackish to reddish shading on woollen material were shown by inoculation experiments to be due to *A. niger* and *A. fumigatus*. Positive results were obtained only on wool kept in damp conditions.

CIFERRI (R.). **Relazione sull' attività del Laboratorio Crittogamico, dell' Osservatorio Fitopatologico e del Centro Studi Anticrittogamici durante l'anno 1943.** [Report on the activity of the Cryptogamic Laboratory, the Phytopathological Observatory, and the Centre for Fungicidal Studies during the year 1943.] - *Atti Ist. bot. Univ. Pavia*, Ser. 5, i (4), pp. 279–362, 10 figs., 1944. [Received February, 1946.]

This report [cf. preceding abstract] contains, *inter alia*, the following items of interest. Studies on foot rot of wheat from various parts of Italy showed that the most important causal fungus was *Ophiobolus graminis*. On the wheat from Florence it was found in 86, 76, and 91 per cent. of the specimens examined in 1938, 1939, and 1941, respectively. Wide differences in susceptibility were observed, *Triticum vulgare*, *T. compactum*, *T. turgidum*, *T. durum*, and *T. polonicum* being susceptible, *T. dicoccum* and *T. spelta* less so, while *T. monococcum* was virtually immune, and *T. abyssinicum* showed wide variability from one strain to another. As regards the soft wheats, the early varieties were the most susceptible, the intermediate ones less so, while the semi-late ones were more resistant than the late. The Strampelli strains generally displayed high or very high susceptibility, as did also the various strains of Società Produttori Sementi di Bologna; Frassineto and Avanzi were moderately resistant, and the Todaro strains highly so. *O. graminis* seems to appear every year in every wheat field, whatever the strains grown or the cultural conditions, but the damage caused varies greatly from year to year and from field to field. Injury is serious only when the fungus becomes established on the collar of the stem, and is more serious the earlier this happens; the condition is also aggravated by unfavourable growth conditions.

Cercosporella herpotrichoides in 1938 caused 7 per cent. of the cases of foot rot examined at Florence, the figures for 1939 and 1940 being 13 and 3 per cent.,

respectively. Most of the damage is produced during winter. Of the species of *Fusarium* associated with wheat foot rot, one of the commonest was *F. graminearum* (*Gibberella saubinetii*) [*G. zeae*].

Soft wheat bunt, due to *Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetida*] is virtually absent from south-central Italy and the islands, and usually causes no appreciable losses in the north, though some recent recrudescence of infection occurred in Lombardy. The absence of bunt in southern and insular Italy is attributed to the relatively high autumn and spring temperatures and to the high resistance of the *Triticum durum* and *T. turgidum* wheats grown.

Watermelons affected by fruit rot showed the presence of a *Sclerotinia*, possibly *S. minor*, an unidentified bacterium, a *Phytophthora*, (?) *P. erythroseptica* (once), and *Pythium debaryanum*. Inoculations of experimentally wounded watermelons with the last-named fungus gave positive results.

Wilted maples (*Acer campestre*) showed the presence of *Armillaria imperialis*, apparently semi-parasitic. This species has recently been placed by R. Singer (*Rev. Mycol.*, N.S., v, 1, pp. 9–10, 1940) in *Catathelasma*, identified with the later genus *Biannularia*, which becomes a synonym.

A leaf spot of groundnuts, accompanied by loss of yield, was caused by potassium deficiency.

Digitalis purpurea and *D. lanata* at Pavia were affected by anthracnose due to *Colletotrichum fuscum* [*R.A.M.*, xvii, p. 822].

In 1937 and 1938, stocks (*Matthiola incana* var. *annua*) were attacked by *Bacterium campestre* [*Xanthomonas campestris*: ibid., xi, p. 517; xxiii, p. 283]. The possible identity of this organism with *Bact. matthiolae* [ibid., xvii, p. 459] is briefly discussed.

Spots on the floral swathes of *Anthurium scherzerianum* in a greenhouse at Pavia showed the presence of *Fusoma calidariorum*, a saprophyte which under certain conditions can probably become to some extent parasitic.

Cardboard boxes affected by moulds which made them commercially useless showed the presence of a *Monilia* of the *M. aurea* group, a *Penicillium* of the *P. crustaceum* group, an *Aspergillus* of the *A. niger* group, an *Aspergillus* of the *A. fumigatus* group and, occasionally, an *Aspergillus* of the *A. flavus* group. The manufacturers were recommended to disinfect the cardboard with nitrobenzolene or by formaldehyde fumigation, if they did not wish to use paraffin; to use starch adhesive as much as possible instead of casein, and to make the adhesive with thymolized water.

Agricultural research.—*Rep. imp. Coun. agric. Res., Delhi, 1944–5*, pp. 1–11, 1945.

On p. 3 of this report [cf. *R.A.M.*, xxiv, p. 7] it is stated that the scheme for the suspension of wheat and barley cultivation in the Nilgiris and Palni hills, sanctioned for three years from March, 1943, to ascertain whether such a step would control wheat rusts [*Puccinia graminis*, *P. glumarum*, and *P. triticina*] in the plains of southern India [loc. cit.] was continued during the period under review; it is, however, to be terminated on the completion of its second year, owing to the heavy cost of the compensation to be paid to growers. To produce a nucleus of virus-free potato 'seed', a central station has been started at Kufri in the Patiala State at a cost of Rs. 94,300 for five years. New virus diseases collected included yellow-vein mosaic of *Althaea rosea*, yellow mosaic of beans (*Phaseolus vulgaris*) and *P. aureus*, and a green mosaic of *Lilium longiflorum*; groundnut rosette [ibid., vii, p. 486] was also collected in connexion with a study of the insect vectors. A scheme for the maintenance of fungus cultures in India is in operation at the Imperial Agricultural Research Institute, New Delhi, the collection now comprising 423 cultures [ibid., xxii, p. 216].

On p. 13 it is stated that in a test of the relative susceptibility to smut [*Ustilago scitaminea*] of sugar-cane varieties by dipping the setts into a spore suspension of the fungus, 18 were fairly resistant, 18 moderately susceptible, and 72 highly susceptible. Exposure of affected setts to a temperature of 55° to 60° C. for 10 minutes fully controlled infection, but greatly reduced germination.

URQUHART (D. H.). **Report on the Department of Agriculture, Gold Coast, for the year 1944–5.**—8 pp., 1945.

This report [cf. *R.A.M.*, xxiv, p. 93] states that cacao swollen shoot [ibid., xxiv, pp. 307, 352] has spread from the original focus some miles west of Koforidua in the Eastern Province westward to the Central Province boundary and north-west up to the Eastern Scarp as far as the Ashanti boundary. From the original focus in the Western Province round Wiawso general spread has occurred eastwards to the Ancobra river, down the valley of the Tano river, and westward on to the French border. In the French Ivory Coast, the northern outbreak is about 10, and the southern about 15, miles from the nearest Western Province outbreaks. Between the Eastern Province and the Western Province areas is a chain of outbreaks, of which the most northerly is the isolated outbreak at Efiduasi. The chief Ashanti cacao districts are virtually unaffected, while the Central Province is also healthy, except for patches on the remote boundaries.

Further tests of cutting out diseased cacao indicated that spread was arrested by removing the infected trees only, as soon as the condition develops, providing every fresh infection is immediately eradicated. Prolonged drought killed patches of cacao in parts of the Eastern Province.

A dying-off of the lateral roots of young lime trees and of the shoots on one side of the trees was associated with *Ganoderma lucidum* and a species of *Trametes*, both of which were prevalent on the dead trees. A detailed survey of budded lemon, orange, grapefruit, and tangerine trees at Asuansi confirmed the greater resistance of rough lemon as compared with sour orange stocks.

[DEIGHTON (F. C.).] **Plant pathology.**—*Rep. Dep. Agric. S. Leone, 1944*, p. 9, 1945.

In this report [cf. *R.A.M.*, xix, p. 692] it is stated that during 1944 four further records of rust (*Uromyces appendiculatus*) on climbing French beans [*Phaseolus vulgaris*] were made in European vegetable-gardens in the Colony of Sierra Leone, and at Kailahun and Njala in the Protectorate. The disease appears to have been introduced on seed from South Africa and, earlier, from the Gold Coast. Maize rust (*Puccinia sorghi*) was recorded for the first time in Sierra Leone, at Bo, where it was doing little harm. A streak disease, presumably of virus origin, was noted on *Pennisetum purpureum* and *Chasmopodium caudatum*, though Guinea grass [*Panicum maximum*] and *Andropogon tectorum* in the vicinity were unaffected.

WIEHE (P. O.). **Division of Plant Pathology.**—*Rep. Dep. Agric. Mauritius, 1944*, pp. 11–12, 1945.

In this report [cf. *R.A.M.*, xxiv, p. 137] it is stated that sugar-cane red rot [*Physalospora tucumanensis*: ibid., xxv, p. 233] was more prevalent in Mauritius during 1944 than during previous years on M. 134/32, as a result of a cyclone experienced in April. New records for the period under review include *Sclerotinia sclerotiorum* on *Brassica chinensis* and *Colletotrichum gloeosporioides* on orchids (*Rhynchostylis* sp. and *Dendrobium chrysotoxum*), causing a leaf spot and blight.

Science for the Farmer.—*Rep. Pa agric. Exp. Sta., 1944–5* (*Bull.* 475), 48 pp., 10 figs., 1 graph, 1945.

This report [cf. *R.A.M.*, xxiv, p. 51] contains the following items of phytopathological interest. In a test of 97 unsprayed potato varieties grown in 30-hill

lots, one strain immune from blight [*Phytophthora infestans*], bred by W. R. Mills, yielded at the rate of 239 bush. per acre. Sequoia, Russet Rural, and Katahdin under comparable conditions gave, respectively, 229, 112, and 109 bush. per acre.

R. D. Anthony reports that where peach potash deficiency [cf. ibid., xxiii, p. 233] had been most serious, annual applications of 400 to 500 lb. muriate of potash per acre were necessary. Work in progress by C. D. Jeffries indicates that in general where a low potash feldspar content and an illite type of clay occur, liberal potash dressings are necessary in peach orchards, though where a high feldspar content and a kaolinite type of clay are present, response to normal potash applications is satisfactory.

D. E. H. Frear, H. J. Miller, and H. W. Thurston found that structural changes in the 'speed' sprayer [ibid., xxiv, p. 63] greatly improved its performance. The high-pressure sprayer produced slightly more packed fruit and slightly fewer culls than the speed sprayer. The time required for spraying each tree was much less for the speed sprayer, though it used an average of 24 gals. spray per tree, as against 14·5 gals. for the high-pressure equipment.

F. H. Lewis reported that fermate, alone or in combination with sulphur, gave improved control of apple rust [*Gymnosporangium* spp.]. The fermate-sulphur mixture offers a new method of rust control with no sacrifice of other features of the apple spray programme [cf. ibid., xxiv, pp. 265, 319, 404].

Bremer (H.). **Über Welkekrankheiten in Südwest-Anatolien.** [On wilt diseases in south-west Anatolia.]—*Istanbul Yaz.* 18, 40 pp., 13 figs., 1 map, 1944. [Received April, 1946.]

During a period of 2½ years spent at the Plant Protection Station of Izmir, south-west Anatolia, Turkey, the writer was impressed by the economic importance of the wilt diseases of cultivated plants, notably tobacco, sesame, and anise, while other crops commonly affected include cotton, eggplant, melon, potato, and various legumes. Epidemics of tobacco wilt occurred in 1935 and 1938, the total reduction in the harvest of the latter year from this source being roughly computed at 6 per cent. The external symptoms of the disease are those of a typical wilt, but a section through the interior of a stem with a discoloured constriction, 3 to 4 cm. in length, prolonged on one side into a narrow strip 10 cm. long, revealed a co-extensive blackening and collapse of the inner cortex. Only in the central portion of the infected area was the xylem also involved, and here the cortex and the adjoining vessels contained a multiseptate mycelium, 4 to 8 μ in diameter, minute, black sclerotia being also present in the rind. A typical symptom of the advanced stage of the wilt is the shrivelling and desiccation of the medulla. The tap-root of the diseased plant was healthy, but the larger lateral roots were mostly shrivelled and somewhat discoloured. Infection obviously proceeds from the cortex and is more or less restricted to the root system and stem base, so that the disease cannot be assigned to the group of tracheomycoses, a salient feature of which is the vascular discoloration ascending from the roots; it also differs from a number of other well-known diseases characterized by wilting. Isolations from the root system of diseased plants yielded *Fusarium scirpi* (already reported by Forsteneichner as a secondary parasite of cotton following primary infection by *Rhizoctonia gossypii* [var. *anatolica*: *R.A.M.*, x, p. 788]), *F. solani*, and *Macrophomina phaseoli* [ibid., xviii, p. 634]. Inoculation tests with the three fungi gave inconclusive results as regards the development of wilting, but their admixture with the soil reduced the average height of the seedlings (50 for each pathogen) after 23 days from 5·4 to 2·5 (*F. solani*), 3·5 (*F. scirpi*), and 4·1 (*M. phaseoli*) cm., respectively. When cut plants in the 5- to 6-leaf stage were placed in test tubes containing Richards's solution staled by 50 days' growth of the organisms (four plants for each), the same order of pathogenicity was observed, *F. solani* causing complete loss of turgor in three

and partial in one, the position in the case of *F. scirpi* being exactly reversed, while *M. phaseoli* partially affected only one.

The fungi in question having been thus shown to act as purely facultative parasites, an investigation was made of the conditions favouring outbreaks of the wilt. Plants do not contract infection until they are about to flower, a fact that probably accounts to a large extent for the failure of greenhouse inoculations. In none of the three years covered by the author's observations were appreciable numbers of wilted plants seen before July. Recovery does not ensue and the percentage of infected or dead plants rises steadily during the summer. Late planting was shown to decrease the amount of wilt developing by early September from 98·1 per cent. in a plot set out on 21st March to 46·2 in one planted on 10th May. Harvesting of the leaves was found to favour the wilt, 96 per cent. of the plants stripped of their foliage in a random sampling in 1939 being affected compared with 64 per cent. of those left intact. Watering of tobacco is usually omitted for fear of impairing the quality of the leaf, but four small test plots were watered a few times in 1938 with the result that only 34 plants wilted compared with 119 in those kept dry. The disease assumes a particularly severe form when there is a dry early summer, such as those of 1935 and 1938, and is mild when there is more rainfall, e.g., in 1939 and 1940. The wilt is confined to south-west Anatolia, where the summer climate is the driest in Turkey, and it is apparent from the foregoing that it is predominantly a concomitant of drought.

Cultural measures likely to reduce the incidence of the trouble are impracticable, and the only possibility of control at present lies in the development of resistant selections, such as Bornova, the incidence of infection in which in 1939 ranged from 0 (planting of 3rd May) to 72·6 (5th April) compared with an average for all plants of 76·2 (10th May) to 95·7 (31st March).

The sesame wilt presents close parallels with that of tobacco both as regards symptomatology, time of development, and the favouring influence of drought. Moreover, *M. phaseoli* and *F.* (?) *solani* were isolated from most of the specimens of diseased material, presumably in a secondary capacity since inoculation experiments were again unsuccessful. Similar observations were also made in connexion with the anise wilt, with which *M. phaseoli*, *F.* (?) *scirpi*, and *F.* (?) *solani* were associated. This crop was further attacked, after an abnormally rainy spell in June, 1940, by *Cercospora malkoffii* [ibid., xi, p. 73], causing a brown or black discoloration and desiccation of the leaves and flowers.

M. phaseoli was isolated from the one case of potato wilt [cf. ibid., xxiv, pp. 96, 202] examined, which occurred in an unwatered plot in July, 1939.

A specimen of wilted cotton submitted for inspection in August, 1938, again yielded *M. phaseoli* and an unidentified *F.* sp. Tracheomycosis due to *Verticillium* was twice observed in other districts in the damp summer and autumn of 1940.

In August, 1940, *F.* (?) *solani* was isolated from the lateral roots of eggplants at Ankara, central Anatolia, suffering from a wilt of the 'dry' type predominating in the south-western part of the province. The same host in the latter region in 1939 was affected by a typical tracheomycosis caused by an undetermined *F.* sp.

Two fields of melons showed conspicuous bare patches in July, 1939, the sites of infection by a *Fusarium* with conidia measuring 7 to 44 by 2·5 to 5 μ, which was isolated from the interior of the roots. The vessels of the tap-roots contained an abundance of mycelium, which was whitish-yellow in pure culture on broad bean stems. Infection is believed to have emanated from the soil.

Ascochyta pinodella was responsible for wilt and black-leg of broad beans and peas, while a *F.* sp. and a *Cephalosporium* were isolated from necroses in the root system of chick peas (*Cicer arietinum*) with pallid stem bases to which dark, irregular, scab-like lines and depressions imparted a 'cauterized' appearance. Legumes are mostly grown in south-west Anatolia as winter crops, and their

pathogens thrive under cold, damp conditions. This type of wilt, which involves entire stands, is essentially a juvenile disease, but another form develops sporadically in April or May. In this case neither cold nor drought can be implicated in the etiology of the trouble, and its only connexion with the group of wilts due primarily to aridity is the occurrence of both at flowering time.

Greaney (F. J.) & Machacek (J. E.). **The prevalence and control of seed-borne diseases of cereals.** *Sci. Agric.*, xxvi, 2, pp. 59–78, 1 map, 1946.

Examination of over 3,000 farm samples of cereal seed from the 1937 to 1942 crops from all parts of Manitoba showed that, of the fungi isolated, *Helminthosporium sativum* on wheat, barley, and rye, *H. avenae* on oats, and *H. teres* on barley predominated. *Fusarium culmorum* and *F. graminearum* [*Gibberella zeae*] were not common.

Infection tests in non-sterile soil clearly indicated that wheat and barley seeds infected by *H. sativum* give a corresponding occurrence of disease in the subsequent seedling stands. In wheat, though not in barley, seed infection by *H. sativum* was associated with low germination.

Of 1,710 wheat samples examined from the 1939 to 1942 crops, only 3·4 per cent. carried more than a trace of bunt (*Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetida*]). Of 518 oat samples 75·9 per cent. had sufficient loose and covered smut (*Ustilago avenae* and *U. levis* [*U. kolleri*]) to render seed treatment necessary. Of 747 barley samples, 72·7 per cent. showed enough covered smut (*U. hordei*) and false loose smut (*U. nigra*) to require seed treatment. These results indicate that seed treatment, particularly of oats and barley, is not being adequately carried out in Manitoba.

The amount of infection caused by seed-borne diseases varied appreciably from locality to locality and from year to year, depending largely upon the particular environmental conditions under which the seed was produced and on the variety of seed grown. Some parts of Manitoba are better suited than others for the production of healthy cereal seed.

Several years' field observations showed that when climatic conditions favour early ripening and harvesting, infection by seed pathogens is low, whereas if warm, humid weather prevails the infection incidence is high.

When infected samples of wheat, oat, and barley seed were treated in greenhouse tests with dilute ceresan dust (5 per cent. ethyl mercury phosphate), almost complete control of seed-borne diseases due to *Helminthosporium* and *Fusarium* spp. was secured. It improved the germination of infected wheat and oat seed, but not that of healthy seed. The treatment of healthy cereal seed is unnecessary unless the seed is sown in heavily infested soil.

The survey demonstrated that in Manitoba nearly 25 per cent. of the seed stocks of wheat, and over 80 per cent. of those of oats and of barley examined from the 1939 to 1942 crops carried disease organisms in sufficient amounts to require seed treatment, the most important organisms being the surface-borne smuts of oats and barley. It is strongly urged that all seed of oats and barley grown in Manitoba should be treated with an approved disinfectant before being sown.

Jenkins (Anna E.). **Saint-Hilaire's records of damage from Wheat rust in Brazil.**—*Chron. bot. Cal.*, ix, 2–3, pp. 147–150, 1945.

Reference has already been made by Grillo (*Rodriguésia*, ii (num. esp.), pp. 109–113, 1936 (issued 1937) and Puttemans [*R.A.M.*, xx, p. 314] to Saint-Hilaire's records of damage from wheat rust in Brazil. In the present paper (*Symbolae phytohistoricae*, No. 7) the writer details all the references to rust, citing in the original French excerpts from the 'Voyages dans l'intérieur du Brésil (1816–1822)', Paris 1830–51, and 'Voyage à Rio Grande do Sul containing the report of his second

trip to Minas and S. Paulo', Orléans, 1887, relating to the occurrence of the disease and mentioning the existence of resistant varieties. In the opinion of Dr. H. B. Humphrey, the species concerned was probably either *Puccinia graminis* or *P. glumarum*.

VALLEGA (J.). **Razas fisiológicas de Puccinia rubigo-vera tritici, comunes en Argentina.** [Physiologic races of *Puccinia rubigo-vera tritici* common in Argentina.]—*An. Inst. fitotec. S. Catalina, 1942*, iv, pp. 40–57, 1 graph, 1 map, 1944. [English summary.]

Physiologic races 5, 13, 20, 26, 49, 57, 62, 105, and 114 of *Puccinia rubigo-vera tritici* [*P. triticina*] were observed in the wheat-growing regions of Argentina between 1938 and 1942 [*R.A.M.*, xxiv, p. 223]. In 1939, 1940, and 1941, race 20 was the most prevalent, but in 1942 race 49 was equally widespread, 13 coming next in frequency, while the remainder were only detected sporadically, and almost invariably as an insignificant admixture with other races.

From the standpoint of breeding wheat resistant to *P. triticina*, the Argentine races may be classified in two groups with well-defined characters of pathogenicity and abundance. The first, comprising 20, 49, 13, and 26, is the most commonly encountered; this group does not attack the differential varieties Mediterranean, Democrat, and Sinovalocho. The second is composed of races 5, 62, 57, 105, and 114, all of which are highly pathogenic to the same three varieties. Generally speaking, at any rate as regards the period under review, the latter group, in spite of its virulent constituents, does not decisively influence the liability of the cultivated varieties to brown rust, which is almost exclusively dependent on their reactions to the races included in the former. It might, therefore, seem sufficient to concentrate on the cultivation of varieties resistant to the races of group (1), but it would be inadvisable to neglect the provision of factors of resistance to the less common races of (2), which at any time might spread and basically modify the reactions of the varieties now deemed to be resistant.

One of the difficulties incidental to this investigation lay in the variable responses of the differential varieties, Carina, Brevit, and Hussar, to races 13, 20, and 49 of *P. triticina*, which complicated the work of identification.

SIMMONDS (P. M.) & SALLANS (B. J.). **Testing Wheat seedlings for resistance to Helminthosporium sativum.**—*Sci. Agric.*, xxvi, 1, pp. 25–33, 1 fig., 1946.

In these analytical studies, designed to assess rapid methods for testing the susceptibility of wheat seedlings to *Helminthosporium sativum* [*R.A.M.*, vii, p. 301; xvii, p. 668], reliance was placed mainly on the test-tube method for most varieties of seeds tested, care being taken to select seed of high viability and quality. The temperature considered most suitable, pending further inquiry, was 24° C. and incubations of seedlings in dark and light did not suggest any appreciable difference in their effectiveness. The tubes were fitted with strips of blotting paper at about 2 in. from the top of the tube so as to provide a shelf on which the seeds inoculated by a conidial suspension were laid. Petri dishes fitted with moistened filter paper, on which the seeds were laid in rows, were used as a second method. The incubation period was five days.

Marquis, Thatcher, Red Bobs, and Apex (most resistant of the Canadian varieties) were shown to be more resistant than Pelissier, Renown, Mindum, and Regent, the last two being most susceptible. Infection varied from 9·6 and 18·6 per cent. for Marquis and Thatcher, respectively, to 83 and 88·3, respectively, for Regent and Mindum. Thatcher was regarded as the most consistently resistant wheat tested. Marquis and Red Bobs have also shown a high average of general performance over several years. Evidence on the parental material represented by Red Bobs and Marquis was confined to a small test with Red Fife, in which it

disclosed moderate to low susceptibility. Seedling tests with Marquis, Kanred, and Jumillo wheats, which figure in the heredity of Thatcher, showed useful to good resistance in the first two, but Jumillo came out indifferently in one trial. H-44-24 × Double Cross, the parental strains of Apex, tested well for resistance, the Double Cross hybrid employed in this test undoubtedly being of the same Thatcher origin and a near cognate of, if not identical with, the same hybrid used in the original Apex cross. The poor showing of the Canadian varieties Renown and Regent, may reflect the presence of Reward in their pedigrees. The value of high quality seed is emphasized by the fact that there was considerable failure to germinate in some wheat, notably with old seed, and mouldiness in some seed and increased blighting after inoculation is thought to suggest the wisdom of preparing a formula for the estimation of disease.

A comparison of varieties, using greenhouse-grown seed possessing uniform quality, confirmed Thatcher as the most resistant, with Marquis and Apex next, and Reward the least. The usefulness of a similar test, using the Petri dish method, illustrated the means of establishing a disease-rating formula, 25 seeds being sown per dish, the results being usually obtainable on the fifth day for classification and estimation as follows: clean, 0; coleoptile lesions present, trace, 1; slight, 2; moderate, 3; and severe, 4. The disease rate was calculated on McKinney's formula [ibid., iii, p. 330]. Provided that complications with rapid mould development do not occur, the method is quite adequate. A disease rate based on weighted degrees of lesions offers a more precise estimation of border-line cases and is also applicable to the test-tube method. Further study of Little Club variety, which tested fairly well in other trials, but came poorly out of this last experiment, is thought desirable.

Simmonds (P. M.). **Detection of the loose smut fungi in embryos of Barley and Wheat.**—*Sci. Agric.*, xxvi, 2, pp. 51–58, 2 figs., 1946.

Barley and wheat loose smuts (*Ustilago nuda* and *U. tritici*, respectively), while not usually of great economic importance in Canada, are a source of trouble, particularly to seed-growers. Both cause considerable loss when incidence is high, are difficult to detect in seed samples, and also to control. Every year in western Canada a few barley fields show up to 20 per cent. of the plants infected by *U. nuda*.

Two methods of detecting embryo infection are described. The embryos are first removed with sodium or potassium hydroxide solutions. In the whole embryo method they are allowed to remain in an excess of water for 12 to 15 hours, then in 95 per cent. alcohol for an hour or two, and finally in one or two changes of absolute alcohol. The sample is cleared in thick cedar-wood oil. Examination of the scutellum under a 70× binocular shows the brownish mycelium in contrast to the transparent host cells. Often the whole scutellum is involved or foci are commonly present in the apical or lateral parts, particularly in the epithelium, but the invasion also affects the adjacent parenchyma. In cases of doubt, the embryo can be dissected and examined in greater detail.

In the sectioned embryo method, the specimens are transferred from the water to 70 or 85 per cent. alcohol, then through the usual butyl-ethyl alcohol solutions, about two hours in each, to pure butyl alcohol. The embryos are then embedded in paraffin wax at 55° C. in small porcelain trays; upon gentle agitation they arrange themselves in layers and sufficient material representing each layer is microtomed. The slides are stained in Harris's haemotoxylin (½ hr.) and in 5 per cent. aqueous Congo red (3 hours), and mounted in balsam. The hyphae stain readily with Congo red and are easily detected. In a test with Glacier barley, field notes (counts based on smutted heads), a greenhouse test (about 200 plants, percentage based on number of smutted plants), and both embryo methods

(100 to 300 examined) agreed in giving, respectively, 21, 21, 20, and 18 per cent. infection. With Newal barley (Indian Head), the corresponding figures were 20, 14, 14, and 11 per cent.

Newton (Margaret), Peturson (B.), & Meredith (W. O. S.). **The effect of leaf rust of Barley on the yield and quality of Barley varieties.** *Canad. J. Res.*, Sect. C, 6, xxiii, pp. 212–218, 1945.

The data on which the tabulated results of these experiments are based extend over one year only, 1941, when the investigation had to be suspended. Two types of six-rowed barley were used, O.A.C. 21 and Mensury, possessing high malting quality, and Chevron, Peatland, Regal, and Plush, of lesser malting quality. Each variety was grown in 12 randomized plots, each of three rod rows spaced 1 ft. apart. Plants of sub-blocks containing one plot of each variety were infected with leaf rust (*Puccinia anomala*) at the five-leaf stage of development. The plants in uninfected control sub-blocks were dusted three times weekly and after heavy rain with kolodust sulphur preparation at a dosage of 30 lb. per acre per application in order to prevent rust attack. Composite samples of each variety from the controls and from the inoculated plots were graded for malting quality at the Malting Laboratory of the University of Manitoba.

All the artificially infected plants were severely attacked by rust, but there were only insignificant evidences of the disease in the dusted plots and scarcely any trace of stem [black] rust [*P. graminis*]. The yield (kernel and bushel weight) of all six varieties tested showed depreciation, the two high grade varieties, O.A.C. 21 and Mensury, showing stronger resistance to the disease than the other four. Decrease in yield was not always proportionate to the incidence of the disease as measured by leaf rust percentages, which, in the case of Mensury and Plush, was much the same, although Mensury showed little reduction in yield while that for Plush fell considerably. This cannot be accounted for by differences in the time of maturity, for Mensury, one of the earliest, ripened only two days before Plush, the latest maturing variety of those tested. Also the incidence of *P. anomala* was at its peak on all six barleys some two weeks before they attained maturity, this differential response confirming Caldwell and collaborators' finding [*R.A.M.*, xiii, p. 754]. The toleration of rust disease by some cereal varieties better than others has yet to be explained.

In general, however, the results clearly showed that an attack by *P. anomala* on barley need not be epiphytotic in order to cause very considerable damage, and where the climatic conditions are such as to favour this pathogen it is regarded as dangerous to plant susceptible varieties.

The effects of *P. anomala* on the malt extract, diastatic power, and wort nitrogen properties of malt were studied in the light of the work of W. O. S. Meredith and J. A. Anderson as recorded in *Canad. J. Res.*, Sect. C, xvi, pp. 497–509, 1938. Since a fall in barley nitrogen content and an increase in malt extract usually go together, in the case of the six samples tested here it might be expected that the loss in kernel weight would be followed by a comparable fall in malt extract. Yet the weight of malt extract recovered from the samples was, on the whole, rather higher than these expectations, and markedly so in the case of Regal, which showed far less loss of malt diastatic power than was suggested by the differences in nitrogen content observed. The known deficiency of this variety in enzymes would account for its not modifying well in the course of malting. In view, however, of the fact that the sample from the rusted Regal plots, and also those of other varieties used in these studies modified reasonably well in spite of the effect of rust incidence on the barley properties, suggests that rust may have acted on the carbohydrate materials of the barley in such a way as to make malt extract more readily available.

Fernandez Valiela (M. V.). **La presencia del 'Helminthosporium avenae' en la República Argentina.** [The presence of *Helminthosporium avenae* in the Argentine Republic.]—*Rev. argent. Agron.*, xii, 4, pp. 281-284, 3 figs., 1945.

Helminthosporium avenae was isolated in pure culture from oat seeds in a fodder mixture in 1942, this being the first authentic record of its occurrence in Argentina. The fungus made good growth on 1 per cent. potato dextrose agar, but sporulation was obtained only on oat dextrose agar at the same concentration: the perithecial stage (*Pyrenophora avenae*) [*R.A.M.*, xiv, p. 690] did not develop. Soil inoculation experiments on oat seedlings resulted in stunting, darkening of the roots and destruction of the root hairs, and basal constriction and necrosis, frequently leading to the death of the plants before heading. Leaf spots were not observed.

Békésy (N. v.). **Kleine Impfmaschine für parasitische Mutterkornkultur.** [A small inoculating machine for parasitic ergot culture.]—*Zbl. Bakt.*, Abt. 2, cvi, 20–24, pp. 474–479, 1 fig., 2 diags., 1944.

Full particulars are given of a small machine for inoculating rye with individual rye ergot [*Claviceps purpurea*] strains from selected sclerotia with a high alkaloid content [*R.A.M.*, xxv, p. 65], which has given very satisfactory results in small-scale trials in Hungary. For the treatment of 1 ha. a period of 15 to 25 working days is required, in the course of which yields of 170 kg. or upwards may be obtained. The alkaloid content of individual sclerotia was shown in an earlier study to vary greatly [ibid., xix, 273], and it has since been ascertained that in Hungary the fungus comprises two races, one of which is rich, and the other poor, in alkaloids.

Vallega (J.). **Observaciones preliminares sobre especialización fisiológica de Puccinia sorghi, en Argentina.** [Preliminary observations on physiologic specialization in *Puccinia sorghi* in Argentina.]—*An. Inst. fitotec. S. Catalina, 1942*, iv, pp. 14–16, 1 pl., 1944. [English summary.]

A preliminary study of the population of maize rust (*Puccinia sorghi*) in the Llavallol district of the province of Buenos Aires indicated the presence of two physiologic races [*R.A.M.*, xiii, p. 573], viz., A, inducing only the type 0 reaction (necrosis) on strain 41.3040, and B, which is highly pathogenic to the same (type 4 reaction). Both in 1942 and 1943, race B was very scarce round Llavallol; this, no doubt, accounted for the paucity of observations of *P. sorghi* on 41.3040 in the field.

Mehta (P. R.) & Bose (S. K.). **A leaf-spot disease of 'Jowar' (Sorghum vulgare Pers.) hitherto unrecorded from India.**—*Curr. Sci.*, xv, 2, pp. 49–50, 5 figs., 1946.

During the past few years, sorghum growing in the vicinity of Cawnpore, India, has been rather seriously affected by leaf spot due to *Titaeospora andropogonis* [*R.A.M.*, xxv, p. 65], not previously recorded from India. First noticeable in the third week of July when the crop is moderately young, it assumes a virulent form towards the end of August. The young lesions are elongate-elliptic, amphigenous, naphthalene-yellow at first, changing to Naples yellow and finally to capucine buff. As the spots mature, the central portion darkens, becoming grey and ultimately sooty, surrounded by a flesh-ochre margin which in fully matured spots is dark red. Later, numerous erumpent, spherical or subspherical, black sclerotia appear on the surface (more prominently on the lower) and are easily brushed off. The lesions (especially those near the margin) coalesce into long streaks. The average size of the individual lesions is 5 by 1 cm., and it is not uncommon to find over half the total leaf area affected.

A coloured subepidermal stroma produces cylindrical, flexuose, 1- to 8-septate, conidia, which are borne at the truncate apex of the conidiophores, measure 56 to 106 by 2 to 3·3 μ but are generally 65 to 75 μ long, usually with one, but occasionally with up to three, lateral branches measuring 16 to 35 by 1·7 to 3 μ. After sporulation the subhymenial cells multiply, the hymenial portion of the stroma is pushed beyond the stomatal opening and produces dark, thick-walled cells which expand into a reniform or hemispherical sclerotium measuring 110 to 230 by 56 to 190 μ.

Simpson (D. M.). **The longevity of Cotton seed as affected by climate and seed treatments.**—*J. Amer. Soc. Agron.*, xxxviii, 1, pp. 32–45, 1 graph, 1946.

In the course of an investigation extending over a period of seven years on the influence of climatic factors and seed treatments on the longevity of Stoneville 2 cotton seed in various locations in the United States Cotton Belt, it was ascertained that fuzzy samples had a slightly lower moisture content than acid-diluted and averaged rather higher in germination. Seed treated with 2 per cent. ceresan germinated better than untreated, probably because of the control in the former of *Mucor* and other fungi. This fungicidal treatment was definitely not deleterious to stored cotton seed.

Arndt (C. H.). **Effect of storage conditions on survival of Colletotrichum gossypii.**—*Phytopathology*, xxxvi, 1, pp. 24–29, 1 graph, 1946.

Portions of two lots of cotton seed (Deltapine 11a and Carolinadel No. 2) naturally infected by the anthracnose fungus, *Colletotrichum* [*Glomerella*] *gossypii*, were adjusted at the South Carolina Agricultural Experiment Station to moisture contents of roughly 8, 10, 12, 14, and 16 per cent., samples of each of which were placed in storage at 1°, 21°, and 33° C., as well as at the air temperature of Knoxville, Tennessee [*R.A.M.*, xxiv, p. 100]. After 12, 17, and 66 months under these conditions, seeds from the various samples were germinated at 24° to determine the extent of survival of the pathogen.

After 5½ years' storage at 1°, over 75 per cent. infection developed on the seedlings arising from seeds kept at 8 per cent. moisture content, while a lower number tended to contract the disease with each consecutive increase in the humidity of the seed up to 16 per cent., at which the incidence ranged from 19 to 27 per cent. In these experiments the fungus generally lost its infective capacity before the viability of the seeds was perceptibly impaired. At higher temperatures survival was greatly diminished.

Non-germinating seeds harboured principally *Fusarium moniliforme* [*Gibberella fujikuroi*], small percentages also being infected by *Aspergillus* spp., *Chaetomium* sp., *Ophiotrichum* sp., and (at 14 and 16 per cent. moisture contents) *Rhizopus* sp.

Volk (N. J.). **Nutritional factors affecting Cotton rust.**—*J. Amer. Soc. Agron.*, xxxviii, 1, pp. 6–12, 5 figs., 1946.

Observations and tests from 1937 to 1943 in Alabama showed that the soil from field areas producing 'rusted' cotton contained about half as much potash as that from adjacent portions on which the crop was healthy [*R.A.M.*, xxiii, p. 225]. The disease did not appear to be associated with boron, copper, zinc, manganese, or magnesium deficiency, and was eliminated by the application of potash to the soil at dosages of 48 to 96 lb. per acre. Sodium nitrate alleviated the disorder but failed to control it in severe cases, while its incidence was increased by heavy applications of phosphorus. 'Rust' assumed an acute form on land from which several groundnut crops had been dug, reducing the exchangeable potash content to very low levels. Potash acted more effectively when applied before planting than as a side-dressing. The anti-'rust' treatment retarded the maturity of the crop to a degree permitting of substantial boll weevil [*Anthonomus grandis*] damage.

Marchionatto (J. B.). **Nota sobre algunos hongos entomógenos.** [Note on some entomogenous fungi.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, i, 8, 10 pp., 1 col. pl., 3 figs., 1945.

Some of the observations on entomogenous fungi in Argentina and other Latin American countries have already been noticed in this *Review* from other sources. Since 1934, when the author described the characteristics of *Beauveria globulifera* (*Rev. argent. Agron.*, xx, pp. 13–18, 1934), he has received specimens of the fungus on *Bombyx mori*, *Laspeyresia molesta*, *Diatraea saccharalis*, and *Listroderes* sp., the countries affected being Brazil, Argentina, and Uruguay. The fungus produced an abundant cottony mycelium and a pulverulent mass of cream-coloured spores on 1 per cent. dextrose agar, while on potato disks it secreted a yellow pigment which partially tinted the medium. *Beauveria bassiana* and *B. effusa* are closely related to the species under investigation, but the mycelium of the former is farinaceous and the latter secretes a reddish pigment [*R.A.M.*, v, p. 95].

Cephalosporium lecanii is widespread on both banks of the La Plata on various cochineal insects [ibid., xiv, p. 98], and of late years it has been determined on *Icerya purchasi* and *Pulvinaria flavescens*.

Cladosporium aphidis, supposed by some authors to be merely a strain of *C. herbarum* [ibid., iii, p. 52; xii, p. 216], commonly develops on the cottony areas colonized by the 'white fly' (*Aleurothriscus howardi*) on the under side of orange and other citrus leaves.

Empusa americana was observed for the first time in Argentina in 1933, parasitizing *Parexorista caridei* on the foliage of a member of the Gramineae, and specimens have recently been received of the same fungus attacking *Lucilia caesar* on a *Eucalyptus* branch.

Empusa aphidis assumes an epizootic character on the cabbage aphid (*B*[*revicoryne*] *brassicae*) in the province of Buenos Aires in rainy seasons, especially in the autumn, and in 1944 material of the same fungus on radish and cereal aphids was submitted from Coloma, Uruguay. The species in question is readily differentiable from *E. planchoniana* [ibid., xvii, p. 240] by its oval conidia, 19 to 21 by 11 to 13 μ, with their papillae situated in the narrow base, and from *E. fresenii* [ibid., xix, p. 213] by its truncate papillae.

Spicaria prasina [ibid., xxi, p. 452] was isolated on potato dextrose agar from the cotton caterpillar (*Alabama argillacea*) from Tucumán; its taxonomy is briefly discussed.

Lounsky (J.). **Het ontsmetten van tuinbouwplanten met hun wortelaardkluiten en meer in het bijzonder van de Azalea.** [The disinfection of horticultural plants with their root soil clods and more especially of the Azalea.]—*Parasitica*, i, 4, pp. 113–128, 6 pl., 1 graph, 1945.

Incidental reference is made in this paper, dealing largely with insects, to *Botrytis cinerea*, which is stated to be responsible for regular heavy losses among *Begonia*, *Gloxinia*, and *Rhododendron* seedlings in Belgian nurseries. Effective control has been achieved by soil disinfection with a 0·5 per mille solution of a commercial product consisting chiefly of mercury chlorophenol, which also proved useful in the campaign against *Pythium debaryanum*. Similar results were subsequently obtained with another proprietary preparation having salicylic acid (1 per mille) as the active ingredient.

Vanderwalle (R.). **Une affection maculicole de Laurus nobilis causée par un champignon nouveau.** [A spotting disease of *Laurus nobilis* caused by a new fungus.]—*Parasitica*, i, 4, pp. 145–151, 2 pl., 1945.

Tetracytum lauri n.g., n. sp., is the name assigned [without a Latin diagnosis] to a fungus causing the development on the under sides of living *Laurus nobilis* leaves

in Belgian hothouses of confluent, brown spots with darker margins, which ultimately spread over a large part of the surface. At an advanced stage of infection, the upper side of the leaf assumes a leaden tinge. The subepidermal tissues of the lower surface contain paraplectenchymatous knots of mycelium.

The fungus is characterized on nutrient agar by reddish-brown colonies and hyaline, fasciculate, septate, sparsely branched conidiophores, 180 to 260 μ in height, bearing a triple sporophore, and terminal, hyaline, cylindrico-oblong, tri-, rarely non- or biseptate conidia, 52 to 75 (mean 62) by 5·2 to 6·5 μ. It is closely allied to *Cylindrocladium scoparium* [*R.A.M.*, xxiii, p. 305] in the Didymosporae, but the tetracellular conidia of the species under discussion definitely relegate it to the Hyalophragmiae and hence the erection of a new genus appears to be called for.

Severin (H. H. P.). **Leaf variegations in perennial Delphiniums.**—*Hilgardia*, xiv, 10, pp. 573–582, 2 pl., 1 fig., 1942. [Received February, 1946.]

Investigations into two leaf variegations [*R.A.M.*, xvii, p. 402] in perennial *Delphinium*, for which the names 'golden leaf' and 'silver leaf' are proposed, suggest that these anomalies are not transmissible by juice or insect inoculations, that they are not virus diseases, but are seed-borne. The patterns of golden-leaf variegation resemble those of calico [ibid., xxii, p. 207] on second-year or older plants, but the two conditions are easily distinguishable because golden leaf affects all the leaves, whereas the symptoms of calico are confined to the basal and intermediate foliage. The most prominent and characteristic pattern of golden-leaf variegation is formed by large, yellow areas extending into the lobes of the leaves. Other patterns show yellow streaking, mottling, or a combination of both; or mostly large yellow-green and green areas, with normal flowers in all cases.

Greyish-white instead of golden areas on the lobes of the leaves are the distinguishing feature of silver-leaf variegation, accompanied on seedlings by numerous small, green dots, some leaves on the same plant showing almost albino lobes with chains of dots extending along the veins. Silver-leaf variegations are often found in seed-beds, but rarely on plants in the field.

Bissett (J.). **The black spot or mosaic in Cymbidiums.**—*Aust. Orchid Rev.*, x, 3, p. 48, 1945.

The writer has found that the sole remedy against mosaic in *Cymbidium* spp. in New South Wales [cf. *R.A.M.*, xxiii, p. 261] is to burn diseased plants as soon as the white, yellow, or black flecks are observed in the new growth. The virus does not appear to be transferable from one plant to another, but develops among orchids potted in poor mixtures or grown under adverse conditions. The freedom of certain individuals from infection points to inherent variations in susceptibility to the disease.

Rose (R. E.). **Germination and conidial number relationship in blind seed disease.**—*N.Z. J. Sci. Tech.*, A, xxvii, 3, pp. 255–257, 1945.

The following technique was evolved at the Department of Scientific and Industrial Research, Palmerston, New Zealand, for the rapid determination of rye grass (*Lolium perenne*) seed infected by the agent of blind-seed disease, *Phialea temulenta*, based on conidial number counts [*R.A.M.*, xxv, p. 168]. One hundred seeds per sample were placed in a test tube with 5 ml. water and heated in a water bath for 15 minutes at 80° C., after which the tubes were shaken for half a minute, a drop of the solution taken for a conidial count with a Zeiss Thoma haemacytometer, and the number covering the 16 large squares registered. Duplicate counts giving satisfactory agreement were made, and the averages are presented in two tables, representing the South and North Canterbury samples, respectively.

The correlation co-efficient for the former was —0·567 and for the latter —0·516, significant at the 5 and 1 per cent. levels, respectively. However, since the error of estimate of germination was 18·2 and 19·2 for the South and North Canterbury samples, respectively, the method can hardly be recommended for harvest-forecast purposes. Hyde's method of pre-harvest determination of germination percentages, based on the appearance of diseased seed [ibid., xviii, p. 186], is stated to give estimates of a very high degree of accuracy.

Leach (J. G.), Lowther (C. V.), & Ryan (Mary A.). **Stripe smut (Ustilago striaeformis), in relation to Bluegrass improvement.**—*Phytopathology*, xxxvi, 1, pp. 57–72, 5 figs., 1946.

Ustilago striiformis from bluegrass (*Poa pratensis*) [*R.A.M.*, xxiii, p. 390] is readily cultivable on artificial media. Chlamydospores are formed in profusion on agar, and though sometimes rather abnormally large and irregularly shaped (oblong or lemon-shaped with pointed ends), they germinate in the ordinary way, producing cultures identical with those arising from the same organs from the host. Germination is effected by the formation of one or more branched germ-tubes that develop into a mycelium on nutrient agar. Two types of colonies occur, one typically mycelial and the other breaking up into sporidia-like fragments. Chlamydospores may be produced by either type, but certain cultures of both remain sterile.

Standard methods of seed inoculation resulted in rather low infection percentages, but a relatively high incidence of smut was obtained by soil inoculation and the injection of chlamydospores with a hypodermic needle into the stem near the growing point. Evidence was obtained that the smut may persist in the soil in the greenhouse up to 256 days. Infection from the soil is not confined to very young seedlings but may occur readily on older plants, probably through young tillers. The feasibility of inoculating vegetatively propagated clones of *P. pratensis* has been demonstrated. If, as there is reason to believe, the present lengthy incubation period can be curtailed, this would appear to be a promising method of eliminating susceptible material and selecting resistant clones in connexion with the programme of breeding for pasture improvement.

Wollenweber (H. W.) & Hochapfel (H.). **Beiträge zur Kenntnis parasitärer und saprophytischer Pilze. V, 3. Diplodia und ihre Beziehung zur Fruchtfäule.** [Contributions to the knowledge of parasitic and saprophytic fungi. V, 3. *Diplodia* and its relation to fruit rot.]—*Zbl. Bakt.*, Abt. 2, cvi, 20–24, pp. 443–464, 4 figs., 1944.

Continuing their studies on *Diplodia* spp. as agents of fruit rot [*R.A.M.*, xxiii, p. 361], the writers carried out inoculation experiments with *D. gallae* (Schw.) Cke (syn. *Sphaeropsis gallae* (Schw.) Archer) from oak (*Quercus rubra*) leaf galls from Michigan, United States; *D. hypodermia* (Sacc.) Wr n. comb. (*S. hypodermia* (Sacc.) Höhn.) from elm (*Ulmus scabra*) branch wood from Fredriksstad, Norway; *D. visci* (DC.) Fr. from mistletoe (*Viscum album*) leaves and branches from Uckermark, Germany; and *D. brunnea* (Bon.) Wr n. comb. (*S. brunnea* (Bon.) Sacc.) from dead beech branches (Germany), and dead sugar maple (*Acer saccharum*) and American sumach (*Rhus glabra*) from Michigan.

D. visci was innocuous to apples and quinces, both of which, however, were fairly vigorously attacked by *D. gallae* and completely rotted within a month. *D. hypodermia* and *D. brunnea* caused a much slower and weaker infection, the decayed areas reaching only 2 to 5 cm. in diameter at the end of the fourth week.

A key is appended for the determination of the 13 species and one variety under investigation (in this and the previous papers), together with a table showing the

extent of the damage caused by each on quinces and apples after 7, 14, and 28 days.

Louw (A. J.). **Peach mildew.**—*Fmg S. Afr.*, xxi, 239, pp. 93-99, 1 fig., 1 graph, 1946.

Peach mildew (*Oidium leucoconium*) [*Sphaerotheca pannosa* var. *persicae*: *R.A.M.*, xviii, p. 463; xxiv, p. 107] first reached epidemic proportions in the western Cape Province in 1941–2, and has now become general throughout the winter-rainfall area. It causes drying-out and shedding of the leaves, twig die-back, and hard, white patches, which may develop into cracks, on the fruit. Even slight infection is undesirable on dessert varieties; and while, for canning purposes, a certain degree of infection is tolerated, some fruit has been refused.

No commercial variety appears to be immune, and Tuscan Cling, Kakamas, and the so-called 'Vark' peach (sometimes used as a rootstock) are particularly susceptible. All nectarines and the white-fleshed peach varieties, Pucelle de Malines, Duke of York, and Inkoos are severely attacked, while Peregrine and Early Dawn are rather less susceptible. Elberta appeared to be least affected.

The first infections occur chiefly on the fruit, the inoculum originating from the diseased dormant twigs and buds of the previous season. Leaf and shoot infections occur much later. Conditions of high humidity accompanied by high temperature favour infection, while the presence of free moisture, as during rain or fog, retards it. Warm, sultry weather is particularly conducive to the disease. Mildew generally appears towards the end of October, and is most severe in December and January. It is worse in the warm interior regions than in coastal areas. Irrigated orchards and those on poorly drained soils are more frequently attacked.

Besides spraying [loc. cit.] removal of infected twigs during winter pruning and improved drainage are recommended. When the trees have become badly affected, the control measures suggested must be carried out for several years before complete recovery can be expected.

Ciferri (R.). **Ulteriori esperienze ed osservazioni sulla 'rosetta' del Pesco nell' Albese.** [Further experiments and observations on Peach 'rosette' in the vicinity of Alba.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxi, pp. 133–156, 1941. [Received February, 1946.]

Further investigations into nutritional rosette of peach trees at Alba, Italy [*R.A.M.*, xiii, pp. 384, 408], demonstrated that the condition is not epidemic. It never showed any tendency to spread, but affected only scattered trees in certain plantings. Only peach trees planted in areas where timber had been felled and uprooted were attacked. The disease gradually became less marked, and after a few years disappeared. If there was an interval of some years between the felling of the timber and the planting of the peaches, the disease did not appear. Cultivation, viz., digging and incorporating organic matter in the soil, effected a temporary improvement, the effect probably resulting from improved soil aeration. The application to diseased peaches of solutions of copper, manganese, boron, and zinc salts had no effect on the condition. The water percolating through the soil in which the affected peaches were growing appeared to be toxic to wheat seedlings, but the toxicity was reduced when the water was exposed to the air, or when an oxidizing agent (oxygenated water or potassium permanganate) was added to it. The toxic principle present in the water was found to have various constituents, most of them thermostable at 100° C. but readily destroyed by oxidation. In nature, inactivation by oxidation appears to be due to the activities of soil micro-organisms.

The evidence taken as a whole indicates that the condition is physiological in nature, and due to toxins present in the soil.

Willison (R. S.) & Berkeley (G. H.). **Tatter leaf of Sweet Cherry.**—*Phytopathology*, xxxvi, 1, pp. 73–84, 2 figs., 1946.

Tatter leaf of sweet cherries has been observed in several orchards in the Niagara Peninsula, Ontario [*R.A.M.*, xxiv, p. 235] since it was first detected on the Black Tartarian variety in 1940, and one strain of the virus responsible for the disease has been transmitted by the double budding technique [ibid., xxiv, p. 197] or by direct grafting of nursery stock or orchard trees to a number of plum, peach, and sweet and sour cherry varieties.

An indistinct mottle of the early leaves was the only symptom to develop in inoculated plums of the Italian prune, Lombard, and Reine Claude varieties.

On Rochester and Elberta peaches the acute symptoms, comprising slight superficial bark necrosis, and foliar ring patterns and chlorotic markings, appear at the opening of the first growing season after inoculation. These are later (usually in the second year) replaced by the chronic features of the disease, including faint mosaic and oak-leaf patterns, dullness and premature ageing of the upper leaf surface, fine red pin-spotting, and red-rimmed, fawn necrosis which may be found on leaves scattered over the tree. Symptoms of the chronic type further displace the acute ones on seedlings inoculated in the late summer and cut back to the bud in the following spring.

In the spring after inoculation, Black Tartarian cherries develop fine, brown lines circumscribing the interveinal areas, which soon undergo necrosis and fall out. Faint yellowish mottling and oak-leaf patterns also occur. Symptom expression appears to be confined to foliage emerging early in the growing season and to diminish in intensity the later the infection. Napoleon is less, and Bing more, affected by necrosis and laceration than Black Tartarian.

Fine, etched rings and necrotic spotting are characteristic of the acute, and undulations, rugosity, and torsion of the leaf blades of the chronic phase of tatter leaf on Montmorency. The acute symptoms on this cherry resemble those of necrotic ring spot and some strains of prune dwarf [loc. cit.], but the interrelationships, if any, of the viruses concerned are still conjectural.

Suit (R. F.). **Currant leaf spot control.**—*Bull. N.Y. St. agric. Exp. Sta.* 709, 13 pp., 2 figs., 1945.

Leaf spot, the most widespread disease of currants [*R.A.M.*, xxv, p. 2] in New York State, is caused as to 85 per cent. by the anthracnose fungus, *Pseudopeziza ribis*, and as to 15 per cent. by *Mycosphaerella grossulariae*. The disease causes premature loss of leaves, resulting in lower yields, shorter life of the plant, and increased disposition to winter injury.

Control measures by spraying vary in their recommendations from two to five applications, the last being usually given after harvesting of the crop, and include concentrations of Bordeaux mixture from 10–10– to 4–6–100, no adhesive agent being advocated in any of the treatments advised. In New York State two sprayings have been considered adequate and timing is the determining factor in their efficacy. About three weeks after blossoming seems the most suitable date for the first application, but it is advisable to observe the bushes from about 15th May when, if the lower or central leaves of a bush show spotting, the first spraying should be given forthwith, the second following immediately after picking of the fruit.

The leaf-spot pathogens overwinter in dead infected leaves on the ground and reach maturity about mid-May with the production of ascospores which attack the leaves in rainy weather. For this reason, the timing of the first spraying is crucially important. Once the spots have appeared on the leaves, conidial production follows and the disease spreads to other leaves as the summer goes on.

It was found that the most satisfactory concentration of Bordeaux mixture was 3–3–100, provided that both surfaces of the leaf were thoroughly treated and the best spreader-sticker employed as well, thus giving increased control. Insoluble copper treatments, which left no objectionable spray residue, were effective providing that their copper content was equal to that of the 3–3–100 Bordeaux and 1 pint of S.E.C. oil added [ibid., xxiv, p. 321] as an adhesive. Spraysoy A and rosin fish-oil soap were satisfactory adhesives when used with Bordeaux mixture but not so effective as S.E.C. oil. Formate, U.S.R. 604, wettable spergon, and lime-sulphur were ineffective.

Gaddini (L.) & Ciferri (R.). **Il Banano nell Oasi di Derna.** [The Banana in the Derna Oasis.]—*Relaz. Monogr. agr.-colon.* 59, 34 pp., 16 figs., 1 map, 1940. [Received February, 1946.]

On pp 28 32 of this publication the authors give an account of bacterial rot (*Bacterium* [*Xanthomonas*] *solanacearum*) of the local banana variety (*Musa paradisiaca sapientum*) [*M. sapientum*] and the Alexandrian banana (*M. nana*) [? *M. cavendishii*] grown commercially at Derna, Libya, summarized from their earlier paper on the subject [*R.A.M.*, xix, p. 158]. *Gloeosporium musarum* occurred on ripe bananas in the Derna market.

Das Gupta (S. N.) & Zachariah (Miss A. T.). **Studies in the diseases of Mangifera indica. Part V. On the die-back disease of the Mango tree.**—*J. Indian bot. Soc.*, xxiv, 3, pp. 101–108, 13 figs., 1 pl., 1945.

Continuing their studies, the authors have investigated the relative pathogenicity or otherwise of *Botryodiplodia theobromae* [*R.A.M.*, xix, p. 355], *Phoma* sp. [ibid., xvi, p. 588], and *Fusarium* (two isolates) [ibid., vii, p. 20] in regard to the die-back disease of mango. The characteristic general symptoms are wilting of the branches and twigs, particularly of the maturer trees, causing later complete defoliation and giving the tree a scorched appearance. Discoloration and darkening of the bark some distance from the tip is the primary external evidence of the onset of 'die-back' and, as this dark area advances, withering of the young green twigs begins, starting at the base, then affecting the midrib, and extending outwards along the veins to the leaf edges. Finally the whole leaf goes brown, accompanied by an upward roll of the margin, and the twig or branch dies, shrivels, and falls after about a month. Gum also may be extruded.

An internal discoloration of the infected twig is earlier discernible about 1 in. on either side in extent towards the tip and base beyond the outer browned bark; and a brown streaking of the vascular tissues is observed on slitting slantwise along the long axis. Epidermal and subepidermal cells of twigs outwardly healthy, apart from small discoloured areas on the stem, were seen at a quite early stage to be slightly shrivelled, areas of the cambium and phloem acquired a brown discoloration, and some of the cells there were observed to be closely filled with a yellow gum-like exudate. Some hyphae were noted in the xylem vessels. The inner cortical areas seemed normal, although cells in the outer layers had begun to shrivel. The final stages of the disease were characterized by extensive shrivelling of the stem tissues, obstruction of the xylem vessels with fungal mycelium, and disjunction of the stele and outer layers along the discoloured streak of disintegrated cambial cells, where there were many hyphae. Mycelium was also present in the petioles and midribs of leaves of diseased twigs.

The results of isolations from diseased twigs and inoculation experiments on healthy growing twigs showed *B. theobromae* to be the causal agent of die-back disease. From some naturally infected twigs only the *Phoma* could be isolated, but its status as a pathogen was not established; there was nothing to suggest that *Fusarium* was pathogenic. None of the fungi was able to attack healthy trees.

High summer temperature is thought to be a possible factor contributing to impaired vitality of the tree, predisposing it to fungal attack [cf. ibid., xvi, p. 670].

THIRUMALACHAR (M. J.). **An Ascomycetous parasite of Cephaleuros.**—*Proc. Indian Acad. Sci.*, Sect. B, xxii, 6, pp. 374–377, 4 figs., 1945.

Cephaleuros parasiticus and *C. mycoidea* [*R.A.M.*, xxi, p. 392] have been collected on numerous hosts in Mysore, where the former in particular is responsible for blemishes on guava fruits. In most of the material examined the algal patches had apparently been destroyed and their red pigment obliterated by a fungus presenting the characters of a species of *Strigula* E. Fr. 1821, closely resembling *S. astridiza* Vain., including minute, black, semi-globose, prominent perithecia and clavate-cylindrical, paraphysate asci each containing eight long, fusiform, quadriseptate, hyaline spores. Zahlbrückner, in the section on ascolichens in Engler & Prantl's 'Die natürlichen Pflanzenfamilien', viii, pp. 67–270, 1926, refers the genus under discussion to the Verrucariaceae and describes it as resulting from the association of algae with an Ascomycete. The nature of the relationship between the algal and fungal components of lichens has been the subject of much controversy: the present instance appears to lend support to E. J. Butler's opinion (Fungi and disease in plants, pp. 413–422, 1918) that the death of the *Cephaleuros* on tea is accelerated by the invasion of fungal hyphae. The crustose, lichen-like appearance is due to cementing together of the dead algal filaments by the gelatinous mycelium.

CIFERRI (R.), BALDACCI (E.), BARBENSI (G.), CAVALLI (L.), & GALLINA (G.). **Primi dati della tecnica di controllo del potere anticrittogamico in vitro.** [First data on the technique of estimating fungicidal power *in vitro*.]—Reprinted from *Chimica*, xx, 1–2, 5 pp., 1 fig., 1944. [Received April, 1946.]

In this paper the authors give a brief account of investigations at Pavia into various methods of estimating the fungicidal properties of spray mixtures. The full report on the work in question has already been noticed from another source [*R.A.M.*, xxv, p. 223].

Les produits antiparasitaires destinés a l'agriculture, l'arboriculture, la viticulture et l'horticulture (Pflanzenschutzmittel zur Bekämpfung von Krankheiten und Schädlingen im Feld-, Obst-, Wein- und Gartenbau).—[Plant protectives for the control of diseases in agricultural, sylvicultural, viticultural, and horticultural crops.]—29 pp., Station de Recherches de Wadenswil et Zürich–Oerlikon, 5° éd., 1944. [Abs. in *Ann. agron., Paris*, N.S., xv, 1, p. 143, 1945.]

This brochure, published every February, is intended as a guide to growers in the choice and use of fungicides and insecticides. The introduction gives the decisions on the control of Swiss phytopharmaceutical products in 1944, following the decree of 12th September, 1941, which brought the sale of fungicides and insecticides under State supervision. These products cannot be manufactured and sold in Switzerland until they have been tested and approved by the Federal experiment stations. The first part lists the products arranged according to the parasites, with notes on the dosages and times of application. In the second part, 307 special products approved during 1944 are catalogued according to the technique of their application and their chemical composition.

BREMER (H.) & ÖZKAN (H.). **The effect of fungicides and insecticides on plants.**—*Zir. Derg.*, vi, 69, pp. 7–23, 1945. [Turkish, with English summary.]

In Turkey Bordeaux mixture is seldom injurious to plants in the predominantly dry climate, damage from this source having been observed by the writers only after the first spring treatments of vines against *Plasmopara viticola* in the coastal regions. In central Anatolia, fruit trees have been sprayed with the mixture at

concentrations of up to 8 per cent. without ill effects in the summer months. Copper sulphate is still widely used for the disinfection of wheat seed-grain against bunt (*Tilletia foetens* [*T. foetida*] and *T. tritici* [*T. caries*]) [*R.A.M.*, xxiv, p. 496].

Parker (E. R.), Middleton (J. T.), & Vanselow (A. P.). **Neutralizing materials for copper sprays.**—*Calif. Citrogr.*, xxxi, 2, pp. 56–60, 1945.

The authors' experiments with various precipitants designed to minimize the damage to plant foliage caused by the presence of soluble copper in spray material showed that copper preparations amended with hydrated lime usually reduced the amount of soluble copper to very low values, particularly with copper sulphate where low copper solubility comparable to that of insoluble copper preparations was obtained. 'Dilute' soda ash did little to lower copper solubility in the filtrate except in association with copper sulphate, when almost all the copper was precipitated, but not so completely as when hydrated lime was used. 'Concentrated' soda ash, however, increased copper solubility in most spray suspensions. The increase over the value obtained with dilute soda was most marked when copper sulphate was used. The addition of small quantities of lime to concentrated soda ash caused a reduction in the soluble copper.

With three concentrations of copper sulphate, the least water-soluble copper occurred when the weight of soda ash in the mixture was two-thirds that of the copper sulphate and with low copper concentration. Zinc sulphate reduced the soluble copper in copper sulphate-soda ash mixtures. Tecmangam, a magnesium sulphate preparation, when added either alone or with zinc sulphate to the copper sulphate-soda ash mixture increased copper solubility, particularly at the higher concentrations of copper sulphate and tecmangam. The possible relationship of the ammonium sulphate content of tecmangam to copper solubility was not investigated. The order of mixing the various ingredients was found to have no appreciable effect on the copper solubility.

Wene (G.) & Rawlins (W. A.). **Compatibility of cryolite and copper fungicides.**—*J. econ. Ent.*, xxxviii, 6, pp. 655–657, 1945.

The combination of the commercial fixed copper compounds, yellow cuprocide, C O C S, spraycop, and basicop with natural cryolite (kryocide) did not reduce the toxicity of the latter to third- and fourth- instar Mexican bean beetle (*Epilachna varivestis*) larvae in spraying tests on beans [*Phaseolus vulgaris*] at the Cornell Agricultural Experiment Station, Ithaca, New York. Bordeaux mixture delayed and decreased the insecticidal action of cryolite, but did not altogether counteract it. In a single field experiment on potatoes for the control of the Colorado beetle (*Leptinotarsa decemlineata*) Bordeaux also retarded the action of cryolite, but did not materially reduce final mortality in comparison with the percentage obtained in two fixed-copper combinations (yellow cuprocide and Tennessee tribasic).

Yarwood (C. E.). **Detached leaf culture.**—*Bot. Rev.*, xii, 1, pp. 1–56, 1946.

With numerous references to the relevant literature the present state of knowledge concerning detached leaf culture, i.e., maintaining leaves in a living condition for various periods after detachment from the plant, is reviewed and discussed. The main points covered include the physiology of detached leaves and the effect of detachment on normal life processes, mechanics of culture, conditions affecting the lives of detached leaves, and the uses and advantages of detached leaves.

Detached leaves have served as a convenient substratum for the total culture (from spore to spore) of members of the Peronosporaceae, Erysiphaceae, Uredinales, Sphaeropsidales, Melanconiales, and Moniliales. Among the more important features of the rusts and powdery mildews studied in this way are carbohydrate nutrition, environmental effect on disease, host range, physiologic specialization, heterothallism, formation of overwintering stages, respiration, and

effect of volatile fungicides. The advantages of the method include economy of space, material, and inoculum, ease of controlled experimentation, and the luxuriant growth of some parasitic fungi. The method has, however, its limitations, e.g., onion leaves die too quickly for the culture of almost any pathogen except *Peronospora destructor*; *Uncinula necator* grows poorly on detached grape leaves; and in fungicide tests detached leaves showed no advantage over entire plants.

A bibliography of 332 titles is appended.

Smith (G.). **An introduction to industrial mycology.**—Third edition.—xiv+271 pp., 143 figs., London, Edward Arnold & Co., Ltd., 1946. 20s. net.

The third edition of this text-book [*R.A.M.*, xxii, p. 74] contains a number of minor alterations and additions designed to increase its clarity and usefulness.

Lindegren (C. C.). **Breeding yeasts for their new role in nutrition.**—*Bull. Mo. bot. Gdn*, xxxiv, 2, pp. 37–43, 5 figs., 1946.

After briefly discussing yeasts in ancient times, pure-culture technique and pasteurization, yeasts of modern times, vitamins and amino-acids in yeasts, selection and hybridization, inheritance, sex, and new hybrids, the author describes a new method of producing yeast hybrids, in which individual spores from a sac are dissected out and grown separately. A culture of *S*[*accharomyces*] *cerevisiae* was obtained with a single set of chromosomes. This species was unable to synthesize pantothenic acid and biotin [vitamin H], but was able to synthesize pyridoxin. From *S. carlsbergensis* a culture of the opposite sex was obtained which was unable to synthesize pyridoxin, though it synthesized pantothenic acid and vitamin H. The hybrid made by mixing these two cultures was able to synthesize pyridoxin, pantothenic acid, and vitamin H.

Kurth (E. F.). **Yeasts from wood sugar stillage.**—*Industr. Engng Chem.*, xxxviii, 2, pp. 204–207, 1946.

Three yeast strains, *Torula* [*Torulopsis*] *utilis* No. 3, *Mycotorula lipolytica* (P-13), and *Hansenula suaveolens* Y-838, were grown on still waste liquor from the production of Douglas fir [*Pseudotsuga taxifolia*] wood sugar alcohol [*R.A.M.*, xxiv, p. 283] at Springfield, Oregon. All three were found to utilize a large proportion of the unfermentable sugars and acids in the liquor, suggesting their potential use in the large-scale conversion of liquors of this type. The yield of dry *T. utilis* may exceed 50 per cent. of the weight of the sugar consumed, indicating the assimilation by the yeast of components other than sugars for its growth. Air diffusion was shown to be an important factor in the rate of yeast development and sugar consumption. With proper aeration by means of gas dispersion tubes of coarse-porosity fritted glass, the time required for these processes was reduced from 72 hours in shaker flasks and 36 to 48 in 4-mm. glass tubing to approximately 18 hours.

Carr (L. G.). **Action of supernatants from combined growth of Fusarium solani and Pseudomonas aeruginosa against the tubercle bacillus.**—*Nav. med. Bull., Wash.*, xlvi, 2, pp. 237–238, 1946.

Fusarium solani was grown for four weeks in a shallow layer on a 1 per cent. hydrolysate of casein, to which was then added a suspension of *Pseudomonas aeruginosa*; the two organisms were allowed to grow together for a fortnight, when the supernatant from the combined cultures was ready for testing against the tubercle bacillus (*Mycobacterium tuberculosis*). The centrifuged supernatant was mixed with an equal volume of a suspension of the bacillus (H 37) (5 mg. per c.c.) and the resulting preparation incubated for 12 hours at 37·5° C., placed for 36 hours in the refrigerator, and treated with 3 per cent. sodium hydroxide for 30 minutes

at 37·5°. In six experiments the growth of the bacillus was entirely suppressed for periods of three weeks to a month and was very slight thereafter. No toxic effects were induced in mice by the injection of 1 c.c. of the crude material; further experiments with the active principle in a purified form are planned.

Arnstein (H. R. V.), Cook (A. H.), & Lacey (M[argaret] S.). **An anti-bacterial pigment from Fusarium javanicum.**—*Nature, Lond.*, clvii, 3985, pp. 333-334, 1946.

'Javanicin' is the name proposed by the authors for a new antibiotic pigment, derived from strains of *Fusarium javanicum* [*R.A.M.*, xxii, p. 13], several of which were seen to inactivate the acid-fast *Mycobacterium phlei*. Javanicin was found to inhibit the growth of *Staphylococcus aureus* and *M. phlei* at a dilution of 1 : 400,000; and Dr. W. H. Tytler reports that the human-type tubercle bacillus was almost completely and apparently permanently inhibited at 1 : 50,000 – 1 : 100,000.

Brian (P. W.) & McGowan (J. C.). **Biologically active metabolic products of the mould Metarrhizium glutinosum S. Pope.**—*Nature, Lond.*, clvii, 3985, p. 334, 1946.

The authors describe the isolation from *Metarrhizium glutinosum* [*R.A.M.*, xxii, p. 328], known as an active decomposer of cellulose [ibid., xxii, p. 73], of a fungistatic substance, to which they propose to give the name 'glutinosin'. Somewhat specific in its antifungal action, glutinosin is not markedly antibacterial. Its aqueous solutions are stable and fungistatic activity endures for 10 days at 25° at P_H range of 2·9 to 7·6, loss of activity being indicated at P_H 8·4. It shares the status of viridin [ibid., xxiv, p. 427] as a specifically antifungal antibiotic, but has much greater stability. The minimum concentration (μgm. per ml.) of glutinosin required to prevent spore germination was as follows: *Botrytis allii* 0·2, *Penicillium expansum* 25, *P. digitatum* 1, *Fusarium caeruleum* 0·8, and *F. graminearum* [*Gibberella zeae*] 50. Glutinosin has no irritant properties but a substance extracted with glutinosin was responsible for a dermatitis developed by those handling large-scale cultures of the fungus.

Hogeboom (G. H.) & Craig (L. C.). **Identification by distribution studies, VI. Isolation of antibiotic principles from Aspergillus ustus.**—*J. biol. Chem.*, clxii, 2, pp. 363–368, 2 graphs, 1946.

Kurung has recently reported the production by *Aspergillus ustus* [*R.A.M.*, x, p. 392] of a substance inhibiting the growth *in vitro* of *Mycobacterium tuberculosis* and *M. ranae* (*Science*, N.S., cii, p. 11, 1945). At the Rockefeller Institute for Medical Research, New York, the writers isolated from a crude extract of the mould two crystalline antibiotics and a third partially crystalline active fraction, using the 'counter-current distribution' technique (*J. biol. Chem.*, clv, p. 519, 1944; clxi, p. 321, 1945).

Krasilnikov (N. A.) & Korenyako (A. I.). Антибактериальные свойства грибка **Aspergillus niger**. [Antibiotic properties of the fungus *Aspergillus niger*.]—Микробиология [*Microbiology*], xiv, 5, pp. 347–352, 1945. [English summary.]

Three out of eight strains of *Aspergillus niger* [*R.A.M.*, xxii, p. 13] were experimentally shown to produce an antibiotic active against Gram-positive and Gram-negative bacteria. It is named aspergillin. Its antibacterial activity was little or not at all affected by the presence of pus or blood serum and proved much more active than mycetin. Aspergillin resembles penicillin in its bactericidal properties but is distinguished from the latter by its inhibition of growth of Gram-negative bacteria and by its greater stability. It is said to be non-toxic for animals.

McComb (A. L.) & Griffith (J. E.). **Growth stimulation and phosphorus absorption of mycorrhizal and non-mycorrhizal northern White Pine and Douglas Fir seedlings in relation to fertilizer treatment.**—*Plant Physiol.*, xxi, 1, pp. 11–17, 4 figs., 1946.

In studies at the Iowa State Forest Nursery two-year-old seedlings of northern white pine (*Pinus strobus*) and Douglas fir (*Pseudotsuga taxifolia*) were planted on two adjacent beds on O'Neill sandy loam soil which had never grown conifers before and was known not to contain active mycorrhizal fungi, one bed being treated at the rate of 1 bush. per 400 sq. ft. with coniferous duff and active mycorrhizal-formative humus. Each bed was divided into three replicates for each species and individual randomized plots were treated with one of six phosphorus or phosphorus, nitrogen, and potassium combinations.

Mycorrhizal development was observed to occur in association with white pine seedlings planted on uninoculated soil fertilized with phosphorus and the trees grew well. The growth of Douglas fir seedlings, which did not form mycorrhizal associations and reacted moderately to phosphorus fertilization, was not normal. Apart from one Douglas fir, healthy growth was always associated with vigorous assimilation of phosphorus. The facts that Douglas fir showed more retarded growth on uninoculated, fertilized plots than on inoculated plots, despite high phosphorus levels in these plots, and that no response was secured by using nitrogen and potassium, suggest the presence of a mycorrhizal stimulus quite apart from that directly due to phosphorus and attributable to an accelerated metabolism, stimulated in this case by phosphorus absorption and the promotion of growth by fungal influence upon the seedling, confirming the senior author's work [*R.A.M.*, xxiii, p. 238], and that of MacDougal and Dufrénoy [ibid., xxiv, p. 29].

Garner (J. M.) & Gottlieb (D.). **Obligate parasitism.**—*Nature, Lond.*, clvii, 3986, p. 374, 1946.

Radio-phosphorus, P^{32}, which is not changed by the host plant, was found at the Delaware Agricultural Experiment Station to afford a simple means of showing that nutrients from the soil were furnished to *Puccinia graminis* through the host plant, a fact that has not hitherto been demonstrated. Little Club wheat seedlings were divided into two lots, of which one was placed in Hoagland's solution and others in a similar solution containing radio-active potassium dihydrogen phosphate in place of the normal form. The plants were inoculated with spores of *P. graminis* race 56, incubated in a moist chamber for 36 hours, and grown under illumination of a 200-watt Mazda lamp at 20°±2° C. Twelve days later analyses of the substratum and of dried samples of the leaves and spores revealed the following amounts of radio-phosphorus in the experimental material: solution (in counts of radio-activity per ml.), 5,900, uninoculated and inoculated leaves and spores (per gm. dry weight), 20,400, 21,067, and 13,200, respectively. On the other hand, radio-activity was absent from the controls grown in Hoagland's solution and from the substratum itself. Radiographs also revealed the presence of P^{32} in the leaves and spores on plants grown in the radio-active solution. It is apparent from these data that the plant absorbs the phosphate ions from the solution, distributing them among the leaves and other organs, whence they are assimilated by the hyphae and ultimately pass to the spores.

Turrell (F. M.). **Effect of sulphur gases in industrial smoke on vegetation.**—*Calif. Citrogr.*, xxxi, 2, pp. 40–41, 1 fig., 1945.

The prospect of further industrial development in California leads the author to examine the effect of sulphur dioxide [*R.A.M.*, xxiii, p. 69], chlorine, ammonia, and hydrogen sulphide gases [ibid., xvi, p. 110] from smoke likely to be absorbed by citrus leaves. Sulphur dioxide (the most toxic gas in large concentrations of

smoke) in combination with water on the wet cell walls, gives firstly the sulphite ion which, oxidized to sulphate ion, passes across the cells to the veins and is excreted by the roots. These reactions, if built up in dangerous concentrations through too rapid absorption by the plant, cause stiffening and swelling of the leaf, loss of water into the intracellular spaces, giving a water-soaked appearance to the leaf which wilts and curls, and chloroplastic collapse, the areas surrounded by veins becoming white, brown, or red, the two latter colours being caused by tannin oxidation. Where the cells in these vein areas are not separated, little gas is absorbed. Otherwise, rapid gas absorption by exposed surfaces causes white or brown spotting of the leaf, the cause of such injury being undeterminable except by chemical or spectroscopic analysis. The internal gas-absorbing surface of the thick-leafed lemon being 22 times that of the outside surface, and 11 times in the case of the vine leaf, which is half as thick as the lemon leaf and frail of structure, lemons will probably suffer more injury from industrial waste smoke gas absorption without showing it. Soil changes, as observed elsewhere, are considered likely to follow further industrialization and to require some modification of plant disease-control practice.

Fernandez Valiela (M. V.). **Principales virus que afectan a la Papa cultivada (con especial referencia a Gran Bretaña). Concepto, enfermedades y mantenimiento de semilla libre de virus ('nucleo stocks').** [Principal viruses that affect the cultivated Potato (with special reference to Great Britain). The concept, diseases, and maintenance of virus-free seed ('nucleo stocks').]—Federación Universitaria de Buenos Aires, Centro Estudiantes de Agronomia, 112 pp., 5 pl., 1 graph, 1946.

This monograph on potato viruses, in general and in particular, the maintenance of virus-free seed stocks, and seed certification, is stated in the author's foreword to be based almost exclusively on information acquired during a stay at the Plant Virus Research Station, Cambridge, in the course of which numerous centres of investigation were visited. A bibliography of 122 titles is appended.

Botjes (J. O.). **De toepassing van een beschuttende enting als middel ter bestrijding van virusziekten bij de Aardappelplant.** [The application of a protective grafting as a means of Potato virus disease control.]—*Tijdschr. PlZiekt.*, xlvi, 6, pp. 181–193, 1940. [German summary. Received February, 1946.]

Köhler's theory regarding the character of potato top necrosis (acronecrosis) [potato virus X] and the development of acquired tolerance through protective grafting [*R.A.M.*, xvi, p. 707] is reviewed in the light of the writer's experiments in Holland from 1929 to 1939 [ibid., xiii, p. 179; xvi, p. 552; xviii, p. 411]. It is concluded that although the possibility exists of the development of complex diseases after protective inoculation, the risk does not appear to be of sufficient magnitude to preclude continuance of further trials in the utilization of attenuated strains of virus for protective purposes.

Coïc (Y.). **Contribution à l'étude de l'action du virus de l'enroulement sur la physiologie générale de la Pomme de terre.** [A contribution to the study of the action of leaf roll virus on the general physiology of the Potato.]—*Ann. agron., Paris*, N.S., xv, 1, pp. 86–109, 1945.

A reduction of 50 per cent. in the yield of the potato Bintje (due to a diminution of the number of tubers rather than size) led to a detailed study of the effect of the leaf roll virus on the general physiology of the Bintje potato. The data obtained indicated that the reduction of growth caused by the virus is due to non-utilization of the reserves in the affected 'seed' tuber. This results from a reduced utilization by the meristems of reserves which have been rendered soluble for active growth.

In contrast to the results of Schweizer [*R.A.M.*, x, p. 332], the nitrogen content of the dry matter in affected tubers remained more or less constant during the development of the young plant.

Inhibition of growth partly explains the physiological disturbance in the vegetative part. As the substances formed in the leaf are not utilized to form new tissues, they may be a cause of the enlarged growth of the leaves already formed and the accumulation in them of carbohydrates. It is, perhaps, in this direction that the effect on the physiology of the vegetative part of certain materials added to the plant (tannins, traces of copper sulphate) or to the soil (chlorates), which produce symptoms resembling those of leaf roll, should be sought.

Attention is drawn to the fact that the symptoms produced by the leaf roll virus were always the same whatever the plant or variety tested.

The evidence showed that starch accumulation in the leaf takes place before any outward symptom of leaf roll appears, and that it is not correlated with leaf-rolling or -hardening. It seems that the accumulation of carbohydrate is partly due to a higher photosynthetic activity in affected plants. This reaction is the opposite of that found in plants attacked by the virus complex, 'frisolée' [ibid., xiv, p. 246], in which the leaves have less dry matter and a lower level of carbohydrates than the corresponding healthy leaves, indicating a considerable diminution of photosynthesis. 'Frisolée' thus produces an even greater reduction in yield than does leaf roll.

As a result of a more abundant photosynthetic production of carbohydrates and the failure to use elaborated materials for growth or storage, the leaves of leaf roll plants become increased in area and thickness with an accumulation of carbohydrates and a reduction in the water content.

Leaf roll plants react to fertilizers (in particular nitrogenous ones), the physiological disturbances being reduced and the external symptoms rendered less apparent.

The biochemical constitution of the dug tubers shows a distinct increase, under the influence of leaf roll, in the ratio $\frac{\text{nitrogenous materials}}{\text{starch}} \times 100$, and this is due to interference by the virus in the utilization of the nitrogenous materials and other plastic compounds, to the advantage of the vegetative part of the plant. There is also a marked reduction in the ratio $\frac{\text{magnesium oxide}}{\text{calcium oxide}}$ in the tubers from leaf roll plants, as compared with those from healthy ones.

Beall (G.) & Cannon (F. M.). **The cause of purple-top of Potatoes, as indicated by a study of its distribution within fields.**—*Amer. Potato J.*, xxii, 12, pp. 362–372, 2 figs., 1945.

A statistical study of the distribution of potato purple top [aster yellows virus: *R.A.M.*, xxiv, pp. 284, 406] within tuber-unit plantings demonstrated that the cause may operate variously over a field, but with similar freedom along and across the rows. The condition cannot be simply transmitted from a plant to its neighbour. There was some indication that a regular proportion of plants in each tuber-unit tend to acquire the condition, as if the structure of the mother-tuber, for each unit, were involved.

Limasset (P.). **Sur quelques mosaïques chroniques de la Pomme de terre.** [On some chronic forms of Potato mosaic.]—*Ann. Épiphyt.*, N.S., xi, 1–2, pp. 58–70, 2 figs., 1945.

Evidence is presented from which the author concludes that the mild form of mosaic disease affecting Royal Kidney, Arran Banner, and Doon Star potatoes in

France is due to potato virus X [*R.A.M.*, xxv, p. 8]. The strain from Royal Kidney showed only slight virulence when inoculated into White Burley tobacco and King Edward and Epicure potatoes. The strains from Arran Banner and Doon Star were of the common type of virus X, characterized by ring spot or wavy lines on White Burley tobacco.

Larson (R. H.) & Albert (A. R.). **Physiological internal necrosis of Potato tubers in Wisconsin.**—*J. agric. Res.*, lxxi, 11, pp. 487–505, 1945.

Serious losses to the late commercial potato crop in sandy areas of Wisconsin during hot, dry seasons are due to internal necrosis (physiological brown or rust spot) of the tubers. The disease has much in common with other non-parasitic types of internal necrosis described in other parts of the world, but no attempt at identification has been made in this study.

Affected tubers show no external symptoms and none are observable in aerial parts of the plant. On exposure to transmitted light, however, the lesions in thin tuber sections are translucent and the flesh of thicker sections shows scattered amber to reddish-brown specks, converging to darker flecks or compact dark brown, ragged lesions spread haphazard throughout the pith within the vascular ring or more rarely diffusing from the ring or seeming to follow the lines of the internal phloem. Sometimes the diseased tissues form merely a necrotic mass. The affected areas were found to be hard, corky, and leathery. Internal necrosis was not followed by the formation of cavities or by internal tuber decay either under field or storage conditions; nor should it be confused with the phloem necrosis caused in certain potato varieties by the leaf roll virus, for it is not reticulate; or with the frost necrosis described by Wright and Diehl (*Tech. Bull. U.S. Dep. Agric.* 27, 24 pp., 1927); or the internal mahogany browning observed in some tubers exposed for long periods to moderately low temperatures [*R.A.M.*, xxi, p. 302]. There are, however, macroscopic and microscopic similarities with the yellow-dwarf virus necrosis described by the senior author [ibid., xix, p. 39, and forthcoming paper]. The absence of recognizable external symptoms seriously increases dehydration and chip manufacturing costs.

Anatomical symptoms are discoloration spreading from the corners of the cell walls in the parenchymatous tissues of the internal medulla, followed by cellular disruption (induced by the pressure of protoplasmic accretions on the walls and abnormal cell division) into necrotic areas. This condition was shown microchemically to be invariably associated with suberization. The occurrence of pentoses were noted, but there was nothing definitely to show lignin, cellulose, or solanin accretions in the diseased tissue. Numerous crystals were present.

Necrosis increased progressively during the growing season in degree and severity, lightly covered tubers being much more acutely affected than those with two or more inches of soil cover, and larger potatoes more than smaller. Necrosis did not appear to increase in storage.

Of 22 standard varieties tested, Triumph, Pontiac, and Red Warba showed considerably more resistance to the disease than Katahdin, Rural New Yorker, Russet Rural, or Harmony Beauty.

Straw mulch applications progressively reduced internal necrosis, but no control of the disease was effected by dressings with hydrated lime, artificial fertilizers containing nitrogen, phosphorus, and potash, sulphur, or with salts of boron, iron, magnesium, or zinc, alone or incorporated in a fertilizing preparation.

Environmental conditions affecting the tubers and roots are thought to influence the disease but existing methods failed to differentiate between temperature and moisture effects although it was apparent that fluctuation in these conditions was more important than in factors such as soil type, organic matter, fertility, and soil reaction.

Wiant (J. S.). **Internal black spot of Long Island Potato tubers.**—*Amer. Potato J.*, xxii, 1, pp. 6–11, 2 figs., 1945.

For several years Green Mountain potatoes arriving at market in New York have shown an internal black discoloration of the tubers tentatively attributed by C. O. Bratley and J. S. Wiant (*Plant Dis. Reptr*, xxiv, pp. 154–157, 1940) to bruising injury [cf. *R.A.M.*, ix, p. 54 *et passim*]. In a survey in Suffolk County black spot was noted in tubers graded and sacked but not in ungraded tubers of the same stock, though many of the latter showed flattened areas resulting from pressure. As a result of tests it was shown conclusively that the condition could be produced by mechanically injuring the tubers on the site of bruises apparently caused by pressure from adjacent tubers; conversely, the condition did not develop at the pressure bruises unless the tissues in these areas were mechanically injured after removal of the tubers from their original position in the bin. Temperature was ascertained to play an important part in the development of black spot; when replicate lots of tubers with pressure bruises were kept for three days at 49°, 61°, and 67° F., respectively, then run over the grader, struck on the pressure bruises, and then returned to their respective temperatures for one day, black spot developed to the greatest extent at the lowest temperature and to the least at the highest.

From the first season's work it is concluded that while symptoms resembling black spot can sometimes be induced in certain potatoes by pronounced mechanical injury to normal areas of the tuber, nearly all black spot due to commercial handling originates in pressure bruises. What predisposes potato tubers to pressure bruises has not yet been determined.

Bonde (R.) & Schultz (E. S.). **The control of Potato late blight tuber rot.**—*Amer. Potato J.*, xxii, 6, pp. 163–167, 1945.

After stating that a survey carried out in 1944 showed that approximately 10 per cent. of the total potato crop of Aroostook County, Maine, decayed in storage as a result of late blight [*Phytophthora infestans*: *R.A.M.*, xxiv, p. 113] tuber rot, the authors describe experiments in which Green Mountain potatoes given five or six spray applications during the season were harvested each year, some after mid-September, when the foliage was mature and dying but still partly green, and some later, when the plants had been killed by frost. After about eight weeks' storage, tuber decay in the former (average of eight 50-lb. samples) was 20, 48, and 53 per cent., respectively, in 1942, 1943, and 1944, as against 0, 4, and 6 per cent., respectively, in the latter.

Other tests in 1944 showed that the amount of tuber decay after six weeks' storage in tubers dug (1) while the foliage was still partly green, (2) two days after killing the tops by spraying with sinox, (3) ten days after the same treatment, and (4) after the tops had been killed by frost was $53 \pm 1{\cdot}8$, $13{\cdot}6 \pm 1{\cdot}5$, $3 \pm 0{\cdot}9$, and $0{\cdot}0 \pm 0{\cdot}0$ per cent., respectively.

It is concluded that most of the late blight tuber rot in Maine results from infection during harvesting while the fungus is still viable on the tops. When late blight is present, the tops should be killed by spraying with a herbicide, or harvesting postponed until the foliage has died off or has been killed by frost.

Reddick (D.) & Peterson (L. C.). **Empire—a blight resistant variety.**—*Amer. Potato J.*, xxii, 12, pp. 357–362, 1945.

A full description is given of a new blight (*Phytophthora infestans*) -resistant potato variety, Empire, produced at Cornell Agricultural Experiment Station, New York. First grown in 1940, it originated as a cross between Rural New Yorker No. 2 and a hybrid seedling partly derived from the immune *Solanum demissum*. Yield tests were carried out in 1944 and 1945 in areas with widely different climatic conditions. Without exception, Empire yielded at least as well as

the standard local varieties, and when blight was a factor, as it was in 1945, it exceeded the standard by two to one.

The new variety is adapted to most parts of New York, but is too late in maturity to be useful on Long Island or in the Adirondacks. In general, it may be regarded as a substitute for Rural. It has been tested repeatedly for immunity by inoculations on young plants in the greenhouse under very severe conditions. On two occasions, however, it has shown a few small blight lesions in the field, which were undetected by experienced growers. They also appeared very late. Although it must be assumed that Empire may ultimately break down it was released to growers of certified seed in January, 1945, on the basis of its performance.

Knorr (L. C.). **Reliability of the stem-ooze test for field identification of Potato ring rot.**—*Amer. Potato J.*, xxii, 3, pp. 57–62, 1945.

To determine the reliability of the stem-ooze test for the diagnosis in the field of the presence of potato ring rot (*Corynebacterium sepedonicum*), i.e., cutting the suspected stem near the point of original seed-piece attachment, squeezing the stem at the cut, and looking for a pearly, milky, viscous exudate at a locus or line between the woody vascular ring and the pith (Eide and Rose: *Minn. agric. Extens. Serv., Folder 95*, 1941), the authors carried out an experiment in which 432 potato plants of 11 varieties were grown from alternating units of ring rot-infected and uninfected seed pieces under two different field environments, planted and harvested on two different dates, and the occurrence of external symptoms noted. The pulled plants were brought to the laboratory, where they were subjected to the stem-ooze test, after which the cut surfaces were smeared on slides for microscopic examination.

The results obtained showed that the percentage of plants correctly diagnosed by external vine symptoms was 85·6, and by the stem-ooze test 97·2. The stem-ooze test is not intended to supplant laboratory examination, but it is certainly an improvement upon field diagnosis dependent on external vine and tuber symptoms alone.

The place of occurrence of true bacterial ooze (as distinct from ooze-like plant juice) is characteristic: it appears at a point or along a line between the woody vascular ring and the pith. In colour it resembles milk, while its consistency varies from that of normal juice to that of coherent little flecks or platelets. A further characteristic of ring rot-invaded stems is that at the locus of oozing the vascular ring is readily separable from the adjacent pith. *Bacterium* [*Xanthomonas*] *solanacearum* and *Erwinia phytophthora* might also be supposed to yield ooze in a test of this kind, but in plants infected with the former a brown stain appears in the diseased vascular ring, while with the latter a marked slimy rot of the basal stem occurs. Neither of these symptoms is caused by ring rot.

Mungomery (R. W.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd, 1944–45*, pp. 20–22, 1945.

In this report [cf. *R.A.M.*, xxiv, p. 205] it is stated that at the end of June, 1945, the only commercial field of sugar-cane in Queensland known to be affected with gumming disease (*Bacterium* [*Xanthomonas*] *vasculorum*) was a second ratoon crop near Cairns. Later, an outbreak was found at Mossman, the most northerly sugar-cane area in Queensland, and every farm in the affected and adjacent areas was supplied with plants of resistant varieties, which include the new Q. 44, Cato, Comus, and Trojan; the older canes, Badila, P.O.J. 2878, D. 1135, and H.Q. 409 are resistant enough to be used. In gumming disease resistance tests at Brisbane C.P. 29/116, Q. 47, Q. 49, and Q. 52 were quite resistant and the New Guinea canes, 28 N.G. 82, 201, 218, 253, and 289 showed no infection, apart from one stalk of 218. Three seedlings from Badila × 28 N.G. 251 were also quite resistant.

For the second year in succession, downy mildew (*Sclerospora sacchari*) was not recorded from the Mulgrave and Hambledon areas. It occurred in Mossman, following flooding from infected fields, where 32 acres were affected, involving the varieties S.J.4, Pompey, and Q. 2. In the Mackay area during the year, all P.O.J. 2878 and Co. 290 canes were inspected in areas formerly infected, but no downy mildew was found. The Bundaberg Cane Pest and Disease Control Board's inspection gangs recorded 1,327 stools of downy mildew for the period under review. Orders for harvesting and ploughing out were issued on the worst blocks. In downy mildew resistance trials in northern Queensland final counts showed no infection on C. 114, C. 150, D. 114, D. 206, D. 233, D. 244, D. 269, D. 277, D. 286, China cow cane, and 32–8560. In similar trials at Bundaberg I. 11, I. 15, Q. 27, Q. 28, Q. 42, Q. 47, Q. 52, and C.P. 29/116 showed no infection. Using P.O.J. 2878 and Reid's Yellow Dent and Golden Beauty maize, the Bureau's workers again obtained evidence that downy mildew is easily transmissible from sugar-cane to maize and vice versa [ibid., xxi, pp. 304, 347].

In the Bundaberg area 7,475 stools were found to be infected with Fiji disease, 3,310 in the quarantined Avondale area, and 1,954 in the Tantitha area. In the Isis area, only four diseased stools were found, and in the Maryborough district the disease was slight and scattered. In the Moreton area the situation was disquieting, nearly 11,000 affected stools being rogued out during the year. A small resistance trial, concluded in July, 1944, showed that Q. 44 was resistant, while Q. 52 and Eros are probably commercially resistant; Q. 45 was about as susceptible as P.O.J. 2878. It was also found experimentally that Q. 47, Q. 49, Toledo, and Trojan showed no infection, while Q. 52 had eight diseased stools in a total of 33, Loethers four in 36, R.P. 8, 13 in 35, and P.O.J. 2878, 22 in 36. Hot-water treatment of the setts, up to the limits tolerated by the buds, did not control the disease.

Leaf scald (*Bact.* [*X.*] *albilineans*) still occurs in the far northern areas. Attacks were fairly widespread on Trojan S.J. 2 and Nanemo were severely affected, and 32–8560, listed as resistant in Hawaii, developed appreciable infection in the propagation plots.

Mosaic is very uncommon in the far north; though present in the Burdekin area, it is not expected to become serious, as active control measures are being taken. In Mackay, it probably occurs on 50 per cent. of the farms, though nowhere seriously. It still occurs in the Bundaberg district, and has increased in the Maryborough area, mainly due to the planting of the tolerant Q. 42.

Red rot [*Physalospora tucumanensis*: ibid., xxv, p. 253] was prevalent in the Moreton area in a very dry period, and probably caused many failures to ratoon in the later-cut blocks of Co. 290.

Chlorotic streak [ibid., xxiii, p. 150] is still serious in most of the northern mill areas and at Moreton, in the south. Almost all the low-lying areas in the north are affected, and the yields are lowered considerably. Prolonged wet weather has caused it to spread over a wider area, and in some localities, including the Mossman district, scarcely a field remained unaffected.

A system of isolation plots has been started in four districts, by which sugar-cane varieties can be transferred from one quarantine area to another in greater quantities than before, thus making new canes available a year or two sooner. If any disease appears the entire planting can be ploughed up without risk of infection to neighbouring crops.

Saint (S. J.). **Report on the work of the Department of Science and Agriculture, Barbados, for the year ending 31st March, 1945.**—17 pp., [1946].

On p. 5 of this report [cf. *R.A.M.*, xxi, p. 161] it is stated that sugar-cane mosaic disease resistance tests in Barbados experiments with the Sein method of artificial inoculation were continued with the object of devising a fool-proof

technique. Plants were exposed to high humidity for periods ranging from 24 to 96 hours both before and after inoculation. The best results follow from 24-hour exposure periods.

Report on the British West Indies Central Sugar-Cane Breeding Station for the year ending September 30th, 1944.—41 pp., [? 1945].

In this report [cf. *R.A.M.*, xxiv, p. 121] it is stated that, in spite of its high susceptibility to mosaic, B. 34104 is the best general-purpose sugar-cane variety in Jamaica. It appears to possess tolerance to the disease. The seedling B. 37172 is highly resistant to mosaic; its field performances are reasonably good, and it is an excellent factory cane. It shows great promise.

Mosaic disease investigations in Barbados seemed to denote several different strains of the virus, but failure to secure infection of B. 37161 with B. 37161 material and of B. 35187 with B. 35187 material indicate deficiencies in the technique used.

Of the B. 41[1] seedlings found to be mosaic-resistant, ten were Glagah derivatives, known to be highly resistant, while the remaining five had the highly resistant 'noble' cane B. 3439 as female parent.

Arruda (S. C.). **As doenças da Cana de Açúcar de S. Paulo (continuação). II. Mosáico.** [The Sugar-Cane diseases of S. Paulo (continuation) II. Mosaic.]—*Biológico*, xii, 1, pp. 21–27, 3 figs., 1946.

The incidence of mosaic in a number of the leading sugar-cane varieties grown in São Paulo, Brazil [*R.A.M.*, xxii, p. 452], is tabulated and discussed. More than half the cane grown for the State factories consists of Co. 290, the percentage of infection in which in seven fields inspected ranged from 60·8 to 100 per cent. The much prized early varieties, P.O.J. 213 and Co. 281, were also fully contaminated, and under local climatic conditions they do not exhibit the marked recuperative powers characterizing them in Louisiana. Of the remaining varieties included in the survey, only C.P. 27/139 and F. 29/7 appear to show any promise as planting material for the future. It is true that the newly introduced American varieties, C.P. 28/11, C.P. 28/19, and C.P. 29/320, are still largely or wholly free from mosaic (12 per cent. infection in the last-named), but their susceptibility to scald [*Xanthomonas albilineans*: ibid., xxiv, p. 432] precludes their use in São Paulo, at any rate for the present.

The writer has never observed *Aphis maidis*, a vector of sugar-cane mosaic, in the cane fields, though it occurs in abundance on maize. On the other hand, *A. sacchari*, which is a common occupant of cane plantations, has not yet been implicated as a carrier of the virus. Alternate hosts of the latter in the State are two kinds of Guinea grass [*Panicum maximum*], known locally as 'marmalade' and 'mattress'.

McM[artin] (A.). **Mosaic disease on Co. 281 and Co. 301.**—*S. Afr. Sug. J.*, xxix, 12, p. 557, 1945.

In February, 1945, a survey of the Natal sugar-cane area revealed the presence of mosaic on Co. 281 [*R.A.M.*, xxiv, p. 166] in the Umhloti Valley on the north coast, and the disease was subsequently detected in a very severe form in the Umzinto district on the south coast, where a few stools of Co. 301 were also attacked. In some fields in the latter region Co. 281 was infected to the extent of 90 per cent. and upwards.

McMartin (A.). **Fungicidal treatments for improving sugar-cane stands.**—*S. Afr. Sug. J.*, xxx, 1, pp. 19, 21, 23, 1946.

This is a summary of the results hitherto obtained in the writer's experiments in the fungicidal treatment of sugar-cane cuttings against pineapple disease [*Ceratostomella pardoxa*: *R.A.M.*, xxv, p. 45]. It is reproduced in *Sugar*, xli, 2, pp. 36–38,

1946, with the addition of supplementary notes on the discussion following the presentation of the original paper at the meeting of the South African Sugar Technologists' Association held at Durban in April, 1945.

Ellis (E. A.). **Flora and fauna of Norfolk. Miscellaneous observations.**—*Trans. Norfolk Norw. Nat. Soc.*, xvi, 2, pp. 172–177, 1946.

The following items are of special interest. Bright orange-yellow uredospores, resembling those of *Coleosporium senecionis* [*R.A.M.*, xxiii, p. 156], appeared on 15 plants of summer chrysanthemum (*Chrysanthemum carinatum*) at Brundall, Norwich, in August, 1945, a new host for Great Britain. *Entyloma fergussoni* produces circular, pale spots on the living leaves of wild and cultivated forget-me-nots (*Myosotis* spp.). It had been collected only a few times in Great Britain, but seems to be rather general in the Yare Valley on *M. palustris* and *M. cespitosa*, where the plants are partially shaded by trees.

Sosin (P.). Матеріали до флоры грибів Кам'янец-подільскої області. [Contributions to the fungal flora of the Kam'yanets-Podilsk province.]—*Бот. Ж. Акад. Наук УРСР.* [*Bot. J. Acad. Sci. U.R.S.R.*], i, 2, pp. 381–386, 1940. [Received April, 1946.]

A list of 38 species of Basidiomycetes, including 14 Polyporaceae, collected from 1932 to 1934, principally in the Tsibulivsk and Ponevetsk forests of the Kam'yanets-Podilsk province is presented in this paper.

Mujica (F.) & Vergara (C.). **Flora fungosa chilena. Indice preliminar de los huespedes de los hongos chilenos y sus referencias bibliográficas.** [Chilean fungus flora. A preliminary index of hosts of the Chilean fungi and their bibliographical references.]—Ministerio de Agricultura, Santiago, 199 pp., 1945.

This valuable contribution to the knowledge of Chilean mycology [cf. *R.A.M.*, xxiii, p. 476 *et passim*] comprises, *inter alia*, a list of fungi, representing 370 genera, arranged under the hosts (which are classified on the lines of Engler and Prantl's 'Die natürlichen Pflanzenfamilien') or substrata, a concordance of the popular and scientific names of the plants enumerated, an alphabetical fungus index, and a 15-page bibliography.

Jenkins (Anna E.) & Bitancourt (A. A.). **Myriangiales selecti exsiccati.**—*Bol. Soc. brasil. Agron.*, vii, 3, pp. 153–166, 1 pl., 1 map, 1944. [English summary. Received April, 1946.]

The contents of fascicle 1 of the Myriangiales Selecti Exsiccati [*R.A.M.*, xxi, p. 428] are summarized and the disposition of the complete and partially complete sets presented to institutions is given. It consists of 50 specimens representing 12 species of *Elsinoë* and *Sphaceloma* known in South America up to 1936 [ibid., xix, p. 366 and xxi, p. 225]. A bibliography of 39 papers brings the previous one [ibid., xxii, p. 179] up to date.

Brodie (H. J.). **Further observations on the mechanism of germination of the conidia of various species of powdery mildew at low humidity.**—*Canad. J. Res.*, Sect. C, xxiii, 6, pp. 198–211, 7 figs., 1945.

The author first summarizes the available data [*R.A.M.*, xvi, p. 104; xxi, p. 261] on the germination of conidia in relation to humidity. The tables relate to nine species of powdery mildews from 21 different hosts and include the following new observations: *Erysiphe graminis*, from five different hosts, was found capable of germination in relative humidities ranging from 0 to 65 per cent.; *Microsphaera alni* from lilac (*Syringa vulgaris*) in relative humidity 35 to 63 per

cent.; *Uncinula salicis* from poplar (*Populus balsaminifera*) in relative humidity 33 to 62 per cent. For each test the temperature and time of year at which the tests were made are given. It is noted that ability to germinate in low humidity differs in conidia of the same species from different hosts, and that although in laboratory tests five species were apparently unable to develop in low humidities yet they are observed commonly in the field in hot, dry weather, e.g., *E. cichoracearum* on *Helianthus* spp.

Experiments with spores of *E. graminis*, in which 300 single spores and a like number of catenulate ones were used, demonstrated in every case that the germination was considerably lower for catenulate than for single, detached conidia. In addition, the longer a conidial chain might be, the less prospect there was of spores germinating, but in those cases where germination was effected, it took place at the end of the chain. In three- or more-spored chains germination began at both ends. The author considers the lower germination of catenulate conidia as a phenomenon to be expected on the basis of previous work [loc. cit.] on the respiratory exchange of gases during germination; the filtration of gases through the terminal to the intercalary conidia may be so slow that, as evidenced by the results of these experiments, no germination takes place at all in these.

The work of Brodie and Neufeld has been carried further in the present studies in efforts to establish the apparent osmotic pressure of the cell sap of conidia of *E. polygoni* (the qualification 'apparent' being employed by the writer because of the special nature of the conidial protoplast) and of *E. graminis* var. *hordei*. Considerable contraction of the conidia took place in strong sucrose solution, and this is thought to account for the fact that there was no plasmolysis in either species. However, in experiments with increasingly strong solutions of potassium nitrate, plasmolysis was achieved and the apparent osmotic pressures of the conidial cell sap obtained were, for *E. polygoni*, about 63 and for *E. graminis hordei* about 68 atm., which are higher than previous records for fungi seen by the author in the literature available to him. If the conidial protoplast in the Erysiphaceae is lacking in much free water, as was thought probable by the writer and Neufeld, and the cell sap in the conidium is concentrated, the absorption of water from relatively dry atmospheres might be assisted by high osmotic pressures. In the presence, however, of protoplasmic density, with possibly, hydrophylic colloidal materials, some intake of water by the germinating spores might take place by imbibition; but neither this nor high osmotic pressure can have much significance when germination occurs in an absolutely arid atmosphere, and the results of further investigation of the protoplastic substances are awaited before any serious explanation of this question can be attempted.

Structural studies of the papillae of the conidia of *E. polygoni* and *E. graminis* suggest that they should not be regarded as germ pores but as structures having a special function representing the point of respiratory exchange in an otherwise impenetrable cell wall.

The apparent failure to germinate of the conidia remaining on the parent conidiophore after abstriction of the terminal one is held possibly to be due to the papilla of the remaining terminal conidium undergoing some change rendering it impermeable.

Fiori (Maria). **Strano comportamento di un Hyphomycete della famiglia delle Dematiaceae.** [The strange behaviour of a Hyphomycete of the family of the Dematiaceae.]—*Nuovo G. bot. ital.*, N.S., xlvii, 2, pp. 448–450, 5 figs., 1940. [Received April, 1946.]

In the course of cultural studies on a disease of *Opuntia ficus-indica*, media inoculated with pieces of affected material showed the presence of a white, subhyaline mycelium with a few scarcely perceptible septa, the hyphae measuring 3 to

5 μ in diameter. In less than a fortnight the hyphae became brown, 5 to 6 μ in diameter, and multiseptate.

From this culture the author obtained two series of subcultures on different media: in all cases, the same mycelium resulted, with the same gradual transformation. Finally, conidia resembling those of an *Alternaria* developed. Other subcultures were kept in the dark for about 40 days, when it was found that almost all the *Alternaria* conidia contained endospores and were changed into sporangia. These endospores were spherical, 3 μ in diameter, and with brown walls; the number varied according to the size and number of the septa in the conidium-sporangium containing them; and they emerged through the apex or at any point in the walls. The change from conidia to sporangia is attributed to unfavourable environmental conditions.

GADD (C. H.). **Report of the Mycologist for 1944.**—*Bull. Tea Res. Inst. Ceylon* 26, pp. 23–30, 1 pl., [? 1945].

In this report [cf. *R.A.M.*, xxiv, p. 121] it is stated that in Ceylon lightning frequently causes the death of tea bushes [ibid., xi, p. 749] in patches of up to 100, never in isolated plants. The plants die successively, and the affected area appears as if attacked by some virulent root disease. Wilting and dying occur characteristically some time after the electric storm has passed. The discoloration in the cortex and wood of affected bushes [loc. cit.] is probably indicative of damage to the delicate water-absorbing parts of the roots.

During the year, one estate reported the death of numerous tea bushes, apparently caused by root disease possibly originating from jak [*Artocarpus integrifolia*] trees. In some patches the condition was rapidly spreading. Two bushes were examined in the laboratory: one was completely dead, but showed no sign of parasitic root disease, the other had living roots, some with characteristic symptoms of lightning injury. All the jak trees except one appeared to be healthy. The patches of affected tea varied in size from areas containing 20 to 30 bushes to areas three or four times as large, each without exception at the foot of a jak tree. Bushes from 13 patches all showed lightning symptoms on the roots. It is suggested that the jak trees had acted as lightning conductors while themselves remaining uninjured.

In a report by T. E. T. BOND an indication that the total range of phloem necrosis [ibid., xxiv, p. 207] may still be increasing was afforded by a new estate record of the disease (the first since 1941) and by the receipt of a severely affected bush from an elevation of 3,500 ft., distinctly below the altitude at which easily recognizable symptoms are generally found. Much interest attaches to the discovery of an undoubtedly necrotic seven-year old supply bush in a Kandapola clearing, the first authentic case of the kind recorded. The external and internal symptoms were typical of an advanced stage of the disease. The bush was at the top of the clearing, about 20 ft. away from old, heavily necrotic tea. This occurrence finally refutes the common belief that phloem necrosis is due to old age.

Further confirmation was obtained that, in general, the disease is absent from high jat bushes and prevalent in medium to low jat bushes. A high jat bush is not necessarily resistant, however, nor is a low jat bush necessarily susceptible.

MCKINNEY (H. H.) & CLAYTON (E. E.). **Genotype and temperature in relation to symptoms caused in Nicotiana by the mosaic virus.**—*J. Hered.*, xxxvi, 11, pp. 323–331, 6 figs., 1945.

As a result of the extreme variation in the expression of local and secondary necrosis in species of *Nicotiana* [*R.A.M.*, xxi, p. 227] and in breeding lines of tobacco carrying the necrosis factor (*N*), the authors undertook a series of experiments with seven species of *Nicotiana* carrying this factor, inoculating them with

the tobacco mosaic virus in cultural conditions at several temperatures for the purpose of determining environmental influences.

They conclude that the so-called *glutinosa*-type of resistance appears to be determined by a gene-controlled temperature-response mechanism which regulates the expression of the necrosis and the mosaic factors present. With the possible exception of *N. repanda*, whose behaviour suggested that the necrosis factor may be isolated from the mosaic factors, each species investigated carries one or more factors for mosaic susceptibility, the presence of which can only be detected at temperatures [ibid., xxi, p. 101] above those favouring severe secondary necrosis. Attempts to effect a cross with *N. tabacum* were unsuccessful. When the *N* factor was transferred to plants carrying the mosaic-resistance factors from Ambalema and T.I. 448 [ibid., xxii, pp. 376, 599] tobaccos, secondary necrosis at high temperatures was greatly reduced or eliminated, with marked control of mosaic. It appeared that the transfer of the *NN* gene from *N. glutinosa* to *N. tabacum* involves an entire chromosome [ibid., xxiii, p. 152]; whether lines carrying the *N* factor are superior to those carrying the mosaic-resistance factors from Ambalema or T.I. 448 tobaccos is therefore not yet clear.

McKay (R.). **'Flue dust' as an agent in the production of sun scald on Tomato seedlings.**—*J. Dep. Agric. Éire*, xlii, 2, pp. 233–235, 4 figs., 1945.

After pointing out that sun scald on tomato seedlings [*R.A.M.*, xix, p. 49; xxii, p. 68; xxiii, p. 413] is rare in Ireland, the author states that in the first week of March, 1944, he received from a grower a box of tomato seedlings affected by the disorder which was thought to be damping-off. Bare patches were present, caused by the collapse of the seedlings at soil-level. Many fallen plants showed severe stem constriction, while others showed a white mark on the stems slightly above soil-level. The compost used in the boxes was very dark and fine on the surface, as a result of mixing 'flue dust' (a by-product from cement works) before sowing.

Further development of the trouble was prevented by sprinkling sand over the soil surface. In September, 1944, and again in March, 1945, the condition was reproduced several times by mixing flue dust with the compost used for raising tomato seedlings or by adding a layer of it to the surface of seed-boxes, and exposing the boxes to direct sunlight in each case. Controls without flue dust remained unaffected, as did seedlings raised in compost mixed with flue dust but kept shaded or continuously moist. The worst sun scald developed when the surface layer of the boxes to which the flue dust was added was allowed to become dry.

Tucker (C. M.). **Phloem necrosis, a destructive disease of the American Elm.**—*Circ. Mo. agric. Exp. Sta.* 305, 15 pp., 8 figs., 2 maps, 1945.

Particulars are given of the distribution of elm phloem necrosis in 24 counties of Missouri [*R.A.M.*, xxiv, p. 126], where the vase, moline, and holly-leaf varieties of the American elm are all susceptible. The available information on different aspects of the disease is summarized.

Boudru (M.). **A propos de la forme supérieure de Brunchorstia destruens Eriksson.** [On the higher state of *Brunchorstia destruens* Eriksson.]—*Bull. Soc. for. Belg.*, lii, 12, pp. 244–253, 1945.

After describing the fructifications of *Brunchorstia destruens*, *Cenangium ferruginosum* (syn. *C. abietis*), *Crumenula pinicola*, and *C. abietina*, and critically discussing the investigations made by various workers into the relationship of these fungi, the author cites C. A. Jørgensen's contribution to the subject [*R.A.M.*, x, p. 272], and concludes that *Cenangium ferruginosum* and *Crumenula pinicola* have no imperfect state and are not genetically related to *B. destruens*; the perfect state of *B. destruens* is *C. abietina* [ibid., xxiii, p. 200].

Gäumann (E.). **Über die Pilzwiderstandsfähigkeit des roten Buchenkernes.** [On the fungal resistance of the red-heart of Beech.]—Reprinted from *Schweiz. Z. Forstw.*, [xcvii], 1–2, 10 pp., 1 fig., 1946. [French summary.]

Whereas some workers claim that the wood of beeches affected by 'red-heart' [*R.A.M.*, xxiii, p. 201] is more resistant to fungal infection than that of normal trees, others maintain the contrary. The results of the author's experiments, involving the exposure of disks of 'red-heart' and sound wood to infection by *Polyporus vaporarius* [*Poria vaporaria*], *Coniophora cerebella* [*C. puteana*], *Polystictus versicolor*, and *Stereum purpureum*, indicate that resistance depends on the degree of progress reached in the formation of the red wood. It is not promoted in the early stages of the process, attains a climax with the maximum production of 'red-heart', and then declines. These observations afford an explanation of the divergent reports concerning the reaction to fungal pathogens of 'red-heart' beech wood.

Kind (A.). **Die Säure-Produktion von Pilzen und deren Einfluss auf mit Kupfersulfat imprägnierte Hölzer.** [The acid production of fungi and its influence on timbers impregnated with copper sulphate.]—*Bull. schweiz. elektrotech. Ver.*, xxxv, 7, pp. 174–176, 3 graphs, 1945.

Gäumann drew attention in 'Tagesfragen der Mastenimprägnierung', 1935 (p. 8), to the production of acids by various wood-destroying fungi in the course of their development, and Rabanus (*Holz Roh-u. Werkstoff*, iii, 7–8, 1940) conducted intensive studies on this aspect of timber impregnation. He found that a number of fungi, notably *Polyporus vaporarius* [*Poria vaporaria*], produce oxalic acid in sufficient quantities to inactivate the copper sulphate on treated wood on an alkaline medium. These observations have a practical bearing on timber preservation in Switzerland, where copper sulphate is almost exclusively used for this purpose, and point to the necessity of obtaining information on the geographical distribution of wood-destroying fungi within the country, as well as on the nature of the soil in which the telegraph poles, etc., are to be set. In districts where *Lenzites* spp. predominate satisfactory results may be expected from the copper sulphate treatment, but the chemical processes initiated in alkaline soils by *P. vaporaria* and other oxalic acid-forming fungi are likely to impair its efficacy.

Markham (R.) & Smith (K. M.). **A new crystalline plant virus.**—*Nature, Lond.*, clvii, 3984, p. 300, 2 figs., 1946.

An apparently previously undescribed virus affecting turnips and referred to as 'turnip yellow mosaic virus' is stated to produce as its chief symptom on this host a bright yellow and green mosaic mottling. Chinese cabbage (*Brassica chinensis* var. Chihli) is also susceptible, reacting to attack with a brilliant white, yellow, or green mottling which resembles a variegation rather than a mosaic.

The virus was successfully isolated by a method which is described in detail. It was ascertained to be present in a high concentration in the host, and to be infectious at dilutions of 1×10^{-5}. It did not appear to be transmitted by insects, but there was some evidence that it was seed-borne to the extent of 2 to 3 per cent.

The virus crystals are very small, isotropic, apparently octahedral, and dissolve readily in water to give a colourless, opalescent solution. The phosphorus and carbohydrate content are those of a nucleoprotein containing about 16 per cent. of nucleic acid of the ribose type.

Stapp (C.). **Bakterielle Rübenfäulen.** [Bacterial Beet rots.]—*Zbl. Bakt.*, Abt. 2, cvi, 20–24, pp. 419–426, 2 figs., 1944.

From wet-rotted fodder beets of the Dänische Barries and Rote Eckendorfer varieties originating in south Germany, as well as from similarly affected turnips

sent by H. L. Werneck from Upper Austria (the latter disease was described in *Landeskultur*, 3–4, 1938), the writer isolated a bacterium corresponding in its morphological, cultural, biophysical, and physiological characters with *Bacterium phytophthorum* [*Erwinia phytophthora*]. Five of the nine beet isolates fell into the sixth serological subgroup of wet rots [*R.A.M.*, xiii, p. 100], while three new subgroups had to be erected for the accommodation of the remaining four and the two turnip strains. Control of the disease should be based on precautions against injuries, e.g., by agricultural implements and insects, through which the pathogen gains ingress to the host, sparing use of nitrogenous manures, and a properly regulated crop rotation.

GIDDINGS (N. J.). **Some factors influencing curly top virus concentration in Sugar Beets.**—*Phytopathology*, xxxvi, 1, pp. 39–52, 1 fig., 1946.

In studies at the Division of Sugar Plant Investigations, United States Department of Agriculture, the curly top virus concentration was found to be much higher in infected susceptible (S.L. 842) than in infected resistant (S.L. 68) sugar beets [*R.A.M.*, xxiv, pp. 83, 130], these observations applying both to the highly virulent strain 1 and the relatively innocuous 2. The difference in virus concentration between resistant and susceptible plants was much greater in the case of strain 2 than in that of 1. In both susceptible and resistant varieties the virus concentration was much higher in plants infected by the highly virulent strain than in those infected with the milder one. After three to eight months the plants harboured a much lower virus concentration than those examined between the third and the twelfth week; this was true for both strains 1 and 2 and regardless whether the source plant was resistant or susceptible. The X^2 test shows high significance in all these virus-concentration differences. The lower virus concentration in the resistant varieties is a favourable factor, since it reduces the rate of spread of curly top among such populations. In all groups studied the fact that resistant sugar beet test plants showed more striking evidence of differences in virus concentration than susceptible plants indicates the possibilities of mass action as a factor in infection [see next abstract].

GIDDINGS (N. J.). **Mass action as a factor in curly-top virus infection of Sugar Beet.**—*Phytopathology*, xxxvi, 1, pp. 53–56, 1946.

Experimental evidence is presented in support of the view that mass action is an important factor in the production of curly top either in the resistant S.L. 68 or the susceptible S.L. 842 sugar beet variety [see preceding abstract]. If the active mass of the virus introduced into the plant suffices to induce predominant reactions, the final result is multiplication of the inoculum and consequent infection. A smaller virus mass initiates reactions similar in kind but too limited in degree to permit of virus multiplication. On this hypothesis, the amount of active virus mass required to induce infection would vary with individual plants and, more especially, with different varieties because of differences in the active mass of the specific reacting substances in the host. As already observed, the latter elements tend to increase with age. It is apparent, therefore, that the cultivation of resistant beet varieties and the eradication of weeds acting as virus reservoirs are valuable aids to the reduction of the amount of inoculum available to the leafhopper vector [*Eutettix tenellus*].

SEVERIN (H. H. P.), HORN (F. D.), & FRAZIER (N. W.). **Certain symptoms resembling those of curly-top or Aster yellows, induced by saliva of Xerophloea vanduzeei.**—*Hilgardia*, xvi, 7, pp. 337–360, 8 pl., 1945.

This tabulated account, arising out of investigations on the leafhopper vectors of aster yellows virus, in which the leafhopper, *Xerophloea vanduzeei*, was tested,

shows that, even when *X. vanduzeei* was reared entirely on healthy asters and was presumably non-infective, symptoms closely resembling those of yellows appeared. Tested on sugar beets, the insect caused some symptoms like those of curly top [*R.A.M.*, iii, p. 537; viii, p. 694; ix, pp. 573, 574], even though it had not been allowed to feed on curly top plants. The effects produced by the feeding of this insect are not likely to be of commercial importance either on beets or asters. Nevertheless, the fact that disorders so closely simulating curly top and aster yellows are produced when apparently the viruses are not present suggests that definite identification of these two diseases is not possible from symptoms alone. Also, similar situations may exist with other sucking insects or syndromes.

In the course of experiments it was shown that the feeding of *X. vanduzeei* on sugar beet induced vein-clearing, previously regarded as a characteristic symptom of curly top. On asters (*Callistephus chinensis*) it induced cleared venation with yellow veinbanding, stunting of the plants, development of axillary shoots from the bud in the leaf axil, and virescence of the flowers, all symptoms of aster yellows. The most striking effect produced is breaking in the colour of the petals. Experiments to inoculate mechanically the leaves, midrib, and petioles of healthy beet seedlings and asters with sap from affected plants were unsuccessful, and known vectors of curly top and aster yellows failed to transmit the causative agent.

In both sugar beets and asters the active principle is systemic and presumed due to a toxic salivary secretion.

GERRITSEN (J. D.) & BURGMANS (H.). **Ascochyta-ziekten bij Erwten (voorloopig onderzoek naar de vatbaarheid van land- en tuinbouwerten).** [*Ascochyta* diseases of Peas (preliminary study on the susceptibility of field and garden Peas).]—*Tijdschr. PlZiekt.*, xlvi, 2, pp. 57–82, 1940. [Received February, 1946.]

Three fungi are concerned in the etiology of anthracnose of peas in Holland, namely, *Ascochyta pisi*, *A. pinodella*, and *Mycosphaerella pinodes* [*R.A.M.*, xii, p. 483], of which the first- and last-named are of considerable economic importance, being probably in some measure pathogenic to all the cultivated varieties. Weather conditions play a decisive part in the development of infection, which is specially favoured by damp summers.

Of the field pea varieties studied from 1932 to 1936 the Schokker types were the most susceptible to *A. pisi* and Mansholt's cross-bred extra short the least so, both to this species and *M. pinodes*, while Mansholt's Corona was also fairly resistant to *A. pisi*. The horticultural varieties sustained heavier damage than the field peas, the tall Nunheims Hekkensluiter being much the most resistant of those investigated. The injury inflicted by *A. pisi* appears to be mainly limited to seed production, which suffers both quantitatively and qualitatively. *M. pinodes*, on the other hand, may attack and destroy very young seedlings through foot rot. Noll has shown that *A. pinodella* behaves similarly to *M. pinodes* in this respect in Germany [ibid., xix, p. 510], and it would therefore be advisable to take account of the former species in further varietal trials in Holland.

VAN BEEKOM (C. W. C.). **Vatbaarheidsverschillen voor koprot (Botrytis spp.) in het nederlandsche Uiensortiment.** [Differences in susceptibility to head rot in the Dutch Onion assortment.]—*Tijdschr. PlZiekt.*, xlvi, 6, pp. 208–211, 1 pl., 1940. [Received February, 1946.]

In two field tests on the susceptibility to the storage rot caused by *Botrytis* spp. of two types of onion [*R.A.M.*, xxv, p. 90], viz., the Rijnsburg and North Dutch straw-yellow and the Zeeuw brown, the average infection in the seven varieties of the former was 3·60 and 2·83 per cent. compared with 1·95 and 1·3 in the four of the latter. These results confirm previous observations in the United States [ibid.,

vi, p. 267] and Holland (*Versl. PlZiekt. Dienst Wageningen*, 90), as to the higher resistance of the coloured varieties, but the writer does not think the differences would be so marked in the case of very severe infection.

Freitag (J. H.) & Severin (H. H. P.). **Insect transmission, host range, and properties of the crinkle-leaf strain of western-Celery mosaic virus.**—*Hilgardia*, xvi, 8, pp. 361–371, 1 pl., 1945.

A mosaic disease apparently different from western celery mosaic [celery mosaic: *R.A.M.*, xviii, p. 369], first observed in the Santa Clara valley of California in November, 1937, showed symptoms resembling the latter disease except that the leaves were usually severely crinkled. It has been found only rarely during routine observation of celery fields. The first symptom is a clearing of the veins on the youngest leaves about ten days after inoculation, followed by a conspicuous yellow veinbanding, with green interveinal areas, narrow at first, but becoming gradually broader and diffuse in outline. The vein-clearing and -banding are often limited to the basal portion of the leaflets, although the whole leaf area may become affected. The interveinal areas become chlorotic, coalesce with the yellow veinbanding to form large amber-yellow areas, resembling celery calico symptoms [ibid., xxii, p. 207]. More obvious symptoms are crinkling of the leaflets and pustulous excrescences, irregular in shape and size, enclosed by chlorotic areas, often in the tissue between yellowed veins. Downward or upward curling of the leaf margin was observed on the youngest leaves of infected plants, producing clearly defined crinkling.

The host range of celery crinkle-leaf-mosaic virus is confined to the Umbelliferae: celery, celeriac, dill (*Anethum graveolens*), salad chervil (*Anthriscus cerefolium*), caraway (*Carum carvi*), coriander (*Coriandrum sativum*), parsnip, anise (*Pimpinella anisum*), and nine varieties of carrot.

The virus, which was thermally inactivated at 60° C. in 10-minute exposures, was found to be more readily transmitted by mechanical inoculation than by the two aphid vectors, *Myzus persicae* and *Macrosiphum solanifolii*, used in these experiments. Only 6 out of 11 species of aphids tested proved capable of transmitting the virus, and these infected only 8·1 per cent. of the plants inoculated. Further studies of host ranges, properties, aphid transmission, and mechanical inoculation, led to the conclusion that the celery crinkle-leaf-mosaic is a strain of western celery mosaic virus.

Freitag (J. H.) & Severin (H. H. P.). **Transmission of Celery-yellow-spot virus by the honeysuckle aphid, Rhopalosiphum conii (DVD.).**—*Hilgardia*, xvi, 8, pp. 375–387, 2 pl., 1 fig., 1945.

Celery yellow spot, first reported in the summer of 1934 in Santa Clara valley and since noted in neighbouring districts, causes little loss to growers, although an incidence of 40 per cent. may occur, as the plants are only slightly stunted and no more than the removal of the spotted outer leaves is required before marketing.

In the course of studies on the disease, celery plants were inoculated by means of the honeysuckle aphid (*Rhopalosiphum conii*). The first and most typical symptoms were observed in the greenhouse 14 days later, as multiform, pale green patches, mottling, or streaks, very soon becoming yellow, usually following the veins, or dotted sporadically over the leaf surface. Round, chlorotic areas occur and may coalesce to form larger spotted ones, which may turn white with leaf maturity. The subepidermal tissues of white-mottled petioles of artificially inoculated plants have brown specks along the veins.

The aphids may retain the virus for 12 days, usually losing the capacity to transmit on removal from the infected host, although several species harbour viruses for 3 to 29 days [*R.A.M.*, viii, p. 804].

The virus, isolated from 25 field-infected poison hemlock plants (*Conium maculatum*), which were symptomless carriers of the disease, was transmitted by *R. conii* to 125 out of 205 celery plants, but attempts at artificial transfer from infected poison hemlocks to healthy ones and from celery to celery, using nine species of aphids and mechanical inoculation, were unsuccessful, although 615 celery plants were tested. The disease was transmitted to 37 out of 85 (43·5 per cent.) celery plants and 14 out of 54 (25·9 per cent.) poison hemlocks by means of honeysuckle aphids obtained on naturally infected *C. maculatum* plants. Low infection capacity of artificially infected poison hemlocks was demonstrated in aphid-transmission experiments. Failure to recover the virus from celery is tentatively attributed to low virus concentration in the celery plant or to plant tissue relations inhibiting aphids from acquiring the virus.

ATKINS (F. C.). **Verticillium on Mushrooms.**—55 pp., 5 pl. (1 col.), 7 figs., 1 diag., Mushroom Growers Association, Midlands Group Publications, Yaxley, Peterborough [? 1945]. 5s.

In this paper the writer has assembled the available information on the mushroom disease caused by *Verticillium malthousei* [*R.A.M.*, xxv, p. 93], with special reference to its commercial aspects, introduction, prevention, and control. Appended are excerpts from 'Control of Mushroom diseases and weed fungi' by W. S. Beach [ibid., xvii, p. 791]; 'Soil sterilization' in the Ministry of Agriculture's Advisory Leaflet 319, 1945; McG. Bulloch's directions for the microscopic examination of mushrooms for *Verticillium*; and a full reproduction of W. M. Ware's 'A disease of cultivated Mushrooms caused by *Verticillium malthousei* sp. nov.' [ibid., xiii, p. 286].

CIFERRI (R.). **Immunità istochimica, effetto micronutritivo e potere anticrittogamico del rame.** [Histochemical immunity, micronutritive effect, and fungicidal power of copper.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxi, pp. 175–183, 1941. [Received February, 1946.]

Some indication having been obtained that vine leaves treated with Casale mixture [*R.A.M.*, xix, p. 581; xxi, p. 240] contain, after careful removal of the deposit from the leaf surface, more copper in the dry ash than leaves treated with Bordeaux mixture and other preparations containing copper [ibid., xxii, p. 287], it has been suggested that the absorbed copper may exert some fungicidal effect against mildew [*Plasmopara viticola*]. Quartaroli, for instance, found that resistance to *P. viticola* was associated with high copper content and has suggested that the insertion of copper wire in the root-layer may permanently prevent infection. The author brings forward detailed arguments against this view, and concludes by stating that the relation between the copper present in the ash of vine leaves and increased resistance to mildew may, if confirmed, indicate, perhaps, an increased stimulation of the vine metabolism by the metal.

Statutory rules and orders, 1946, No. 335. Destructive Insect and Pest Acts, England. The Sale of Strawberry Plants and Blackcurrant Bushes Order, 1946. Dated March 8, 1946.

With the object of preventing the distribution of virus-infected stocks the Sale of Strawberry Plants and Blackcurrant Bushes Order of 8th March, 1946, coming into operation on 1st October, 1946, prohibits the sale in England and Wales of black currant bushes and strawberry plants except those originating from stocks certified not earlier than the previous 1st June under the Ministry of Agriculture's certification scheme or comparable projects administered by the other Agricultural Departments of the British Isles.